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THE GRASSES OF BAJA CALIFORNIA, MEXICO

FRANK W. GOULD
AND
REID MORAN

SAN DIEGO
SOCIETY OF NATURAL HISTORY

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The Grasses of Baja California, Mexico

Frank W. Gould¹ and Reid Moran²

INTRODUCTION

The peninsula of Baja California lies along the west coast of Mexico, separated from mainland Mexico by the Mar de Cortés, or Gulf of California (Fig. 1). The political entity of Baja [=Lower] California extends slightly north of the peninsula proper, to the southern boundary of the United States and of Alta [=Upper] California—which has largely usurped the name of California. This northern boundary of course is arbitrary biologically, as is the short northeastern boundary with Arizona and Sonora at the Río Colorado. In large part, however, Baja California is a separate unit biologically; and its separateness makes it an inviting unit to deal with.

Baja California is just under 1300 km long in a nearly NNW–SSE direction, extending from 32°44' to 22°51' north latitude. It is about 40 to 230 km wide, with an area of about 143,600 km². Politically, it is divided at the 28th parallel into Baja California Norte [=north], with capital at Mexicali, and Baja California Sur [=south], with capital at La Paz.

The backbone of the peninsula is a series of mountain ranges with generally steep escarpments to the east and somewhat gentler slopes to the west and with crests closer to the east coast (Fig. 1). In the north are the Sierra Juárez, with several summits between 1900 and 2000 m, and the Sierra San Pedro Mártir, highest range in Baja California, with a large area above 2000 m and with El Picacho del Diablo reaching 3095 m. Next southward after some lower peaks are the Sierra San Luis (or Sierra de la Asamblea), with a summit of about 1650 m, and the Sierra San Borja, with Cerro la Sandía reaching 1820 m. Northernmost in Baja California Sur, north of San Ignacio, is the Sierra San Francisco, with Cerro de la Laguna at about 1600 m. East of it is the isolated Volcán las Tres Vírgenes, at 1995 m possibly the highest peak south of the Sierra San Pedro Mártir. Southward along the east coast are the Sierra Santa Lucía and/or Sierra de las Palmas and the Sierra de la Giganta, with Cerro la Giganta reaching about 1767 m. In the Cape region south of

La Paz is a granitic range with one peak above 1900 m, in a separate system with the steeper escarpment to the west: this is sometimes called the Sierra Victoria, though the northern part is more commonly known as the Sierra de la Laguna.

Phytogeographic Regions

Although biologists have variously subdivided Baja California, many now agree in the main on three regions. Shreve (1951: map 1) marked these off in delimiting the desert on the basis of the vegetation, and Wiggins (1960: fig. 1) named them as phytogeographic or floristic areas: the northwest or Californian region, the Cape region, and the desert. Though boundaries of course are indefinite and debatable, this breakdown seems both natural and useful.

The northwest region is west of the San Felipe Desert, from the upper east slopes of the Sierras Juárez and San Pedro Mártir to the Pacific, and south about to El Socorro (Shreve, 1936). It also includes the inshore Islas los Coronados, Todos Santos, and San Martín, and the oceanic Isla Guadalupe, 252 km offshore. The eastern boundary, at the steep eastern escarpment of the sierras, is relatively sharp; but the transition southward to desert is gradual and hence the boundary there more arbitrary. Rainfall is mainly from the northwest, in winter and early spring, decreasing southward into the desert. On the western slope is the broad band of dense shrubby evergreen vegetation known as chaparral, its lower limit near sea level on north slopes in the north and ascending southward. Above about 1300–1800 m is coniferous forest—which some prefer to treat as a fourth major unit. Below the chaparral is a lower, more open, and less woody vegetation known as coastal sage scrub, with many of the bushes drought-deciduous; southward in the transition to desert it becomes still more open, with more cacti and other succulent plants (Shreve, 1936; Mooney and Harrison, 1972).

Plants characteristic of the northwest region occur southward above desert vegetation on scattered higher peaks to form outposts of this region (but also with some southern plants) as far south as Isla

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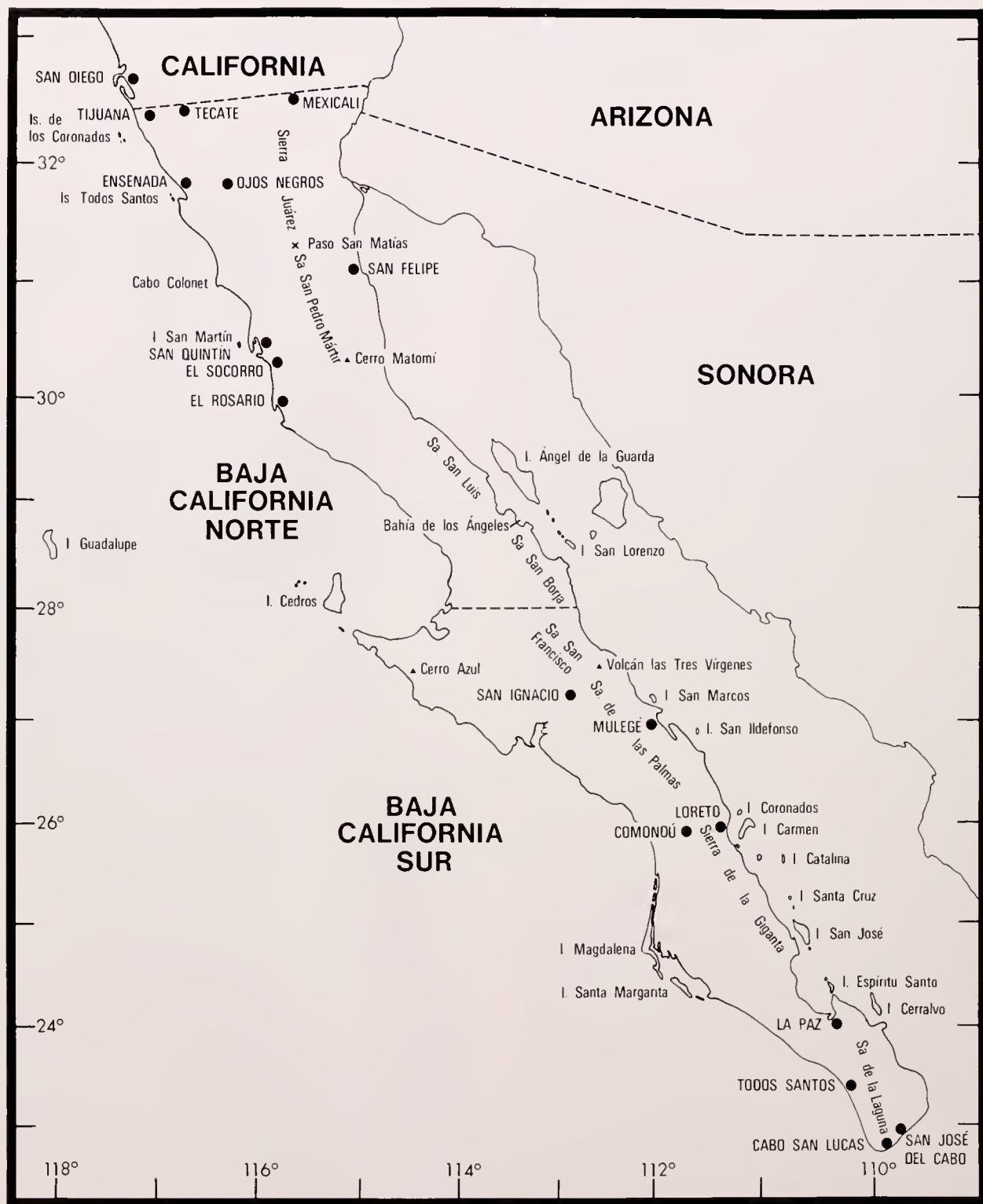


Fig. 1. Baja California.

Cedros (28°08'N) and Volcán las Tres Vírgenes (27°29'N)—and individual species extend farther. Before the origin of the deserts in late Quaternary, presumably the southern outposts were more nearly continuous with the northwest region; now they underscore the difficulty of drawing boundaries.

The northwest region is the southern end of the California Floristic Province, which extends through California west of the Sierran axis, to southwest Oregon (see Raven and Axelrod, 1977).

The Cape region of Baja California, in the usual sense, is the largely mountainous area straddling the Tropic of Cancer at the southern end of the peninsula. Rainfall is mostly in summer and from the east and is substantially greater than in the desert. The vegetation has not yet been studied in detail. At lower elevations is a rather varied xeric deciduous woodland, less uniform and less spiny than the thorn scrub of the adjacent mainland, with many shrubs, cacti, yuccas, and vines, and so with the "air of an impoverished tropical jungle" (Shreve, 1937). At higher elevations is oak woodland, which slightly higher, about La Laguna, is dominated by piñón (*Pinus cembroides* Zucc.), with *Arbutus* and *Nolina*. Here are many northern plants: according to Brandegee (1892), of 148 montane species, 42 occur also in Alta California.

The Cape region is separated from the rest of the peninsula by a low isthmus with marine deposits. Apparently it was an island through much of the Tertiary and a refugium from which many plants later spread northward. For tropical plants it is still an island. It has many endemics, and the ratio of species to genera is low—about 1.9:1 (Brandegee, 1892).

Desert vegetation extends south on the coasts of the Cape region, and many mainly desert plants occur locally inland. On the other hand, the xeric woodland and oaks extend north through the Sierra de la Giganta (Shreve, 1937) and various species on through the Sierra Santa Lucía and to the Sierra San Francisco, as well as to some offlying islands. Thus the Cape region in the usual geographical sense is no longer the neatly delimited phytogeographical region that it may have been as an island. The boundary has blurred, and the present *biogeographical* Cape region is variously defined. Perhaps it is best taken as the area of xeric woodland and montane vegetation above, as shown by Wiggins (1960: fig. 1). However, this more natural area is harder to delimit and so in a way less practical than the Cape region in the usual geographical sense.

The rest of Baja California, about 70 percent of the area, is the desert region, extending full width in the central part and nearly full length on the east side. Rainfall is low and uncertain, in some years none, and is variously distributed through the year. The diurnal and yearly range of temperatures is great, and daytime summer temperatures are high. Shreve (1951) characterized the desert vegetation as (1) generally *low*, but the plants of very unequal stature; (2) *open*, the spacing of the perennials increasing with aridity; and (3) *diverse*, with many life forms—he distinguished 25—among the dominant plants. The desert region is part of the Sonoran Desert (Shreve, 1951), for which on the basis of the vegetation, Shreve distinguished eight subregions, four of them at least partly in Baja California. Hastings and Turner (1965) thought the vegetational differences among these four subregions due largely to relative seasonal differences in amount and reliability of rainfall.

Axelrod (1979) concluded that the Sonoran Desert was formed with increasing aridity during the interglacials of late Quaternary, its flora derived from plants of scattered semiarid habitats.

The Grass Flora

Beetle (1977b) analyzed the reported grass flora of Baja California in terms of (1) where the species occur in Baja California and especially whether in the northern or southern half or both, and (2) where they occur outside Baja California. He found 116 grasses reported for Baja California Norte but not for Baja California Sur, 67 for Baja California Sur but not for Baja California Norte, and 60 for both. For the northwest region he listed 16 native and 12 introduced grasses as confined to the area of Mediterranean climate; 13 natives as associated with oak forest and 7 with mezquite woodland, these 20 all with Great Basin affinities; and 12 natives as confined to the higher mountains. He listed 18 grasses as elements of the Sonoran Desert flora. And finally, he listed 84 grasses as elements of the flora of the Mexican mainland south of the Sonoran and Chihuahuan Deserts. He concluded that the grass flora of southern Baja California is derived mainly from that of the Mexican Highland, apparently through chance overwater arrivals.

We describe 96 genera and 274 species of native and introduced grasses for Baja California, with brief notes on a few other reported species. Many parts of Baja California, but particularly the central and southern mountains, still are little explored bo-

tanically. Notably, 5 genera and 50 species of grasses are known to us in Baja California from only one collection each and 3 genera and 15 species from only two collections each. This fact suggests not only how close these species came to being overlooked but also how many others must still remain to be found.

Of our 274 species, 60 or more are introduced—it is hard to know whether some weedy tropical grasses are native or not. A few cultivated grasses such as *Zea mays* and *Saccharum officinarum* are not known to escape; and a few others like *Hordeum vulgare*, *Sorghum bicolor*, and *Triticum aestivum* become occasional roadside waifs but do not persist.

We tentatively retain seven species and one variety as endemic to Baja California: *Aristida purpusiana*, *Bouteloua annua*, *Chloris brandegei*, *Muhlenbergia brandegei*, *Orcuttia fragilis*, *Setaria palmeri*, *Stipa bracteata*, and *Trisetum interruptum* var. *californicum*. The *Stipa* and the *Trisetum* are in the northwest region; the *Bouteloua* and the *Muhlenbergia* in the central desert; the *Orcuttia* on the Llano de Magdalena; the *Chloris* and the *Setaria* in southern Baja California, from the desert into the Cape region; and the *Aristida* from San José del Cabo, in the Cape region. The *Stipa* is known from only one collection, the *Trisetum* from two, the *Muhlenbergia* from three, and the *Aristida* from three but all from one place. At least the *Aristida*, the *Chloris*, and the *Setaria* are doubtfully distinct from nearest relatives.

We can make a few generalizations about grass distributions in Baja California. Some 44 native species are known to us in Baja California only in the northwest region and 15 of these only in the Sierra San Pedro Mártir. Another 10 grow at the desert edge or mainly in the northwest with a few desert occurrences. Some 35 of the introduced grasses, chiefly European weeds, likewise are mainly in the northwest, though a few of these are making their way southward into the desert. Another 19 natives occur in the northwest but also southward in the mountains to midpeninsula or farther. About 38 natives are known in Baja California only in the Cape region, south of La Paz, and 22 of these only in the mountains. Another 8 are known in Baja California only in the mountains of the southern half. For lack of information both as to grass distributions and as to boundaries of the biogeographical Cape region, it is hard to pursue correlations further.

Collectors

We mention a few of the principal collectors who have added records of grasses from Baja California. For further information on the botanical exploration of the peninsula, see Nelson (1921), Lindsay (1955), and Wiggins (1980).

Richard Hinds and George Barclay on H.M.S. *Sulphur* collected at San Quintín, San Bartolomé, Bahía Magdalena, and Cabo San Lucas in 1839; and the plants were described by Bentham (1844), who proposed four new species of grasses, the first described from Baja California (collections at BM¹).

The most important early plant collector in Baja California was T. S. Brandegee (1843–1925), who made six trips between 1890 and 1902 into the mountains of the Cape region, one in 1889 overland from Bahía Magdalena to San Quintín, one in 1893 from San Diego high into the Sierra San Pedro Mártir, and one in 1897 to the west coast islands (UC, CAS; also US) (Moran, 1952).

Other collectors of this period were Palmer, Orcutt, Purpus, and Jones. Edward Palmer (1831–1911) made large collections on several trips to Baja California between 1869 and 1890, as on Islas Carmen and Guadalupe, in the Sierra Juárez, and on both coasts of the central peninsula—where commonly he was the first collector (GH, US) (McVaugh, 1956). Charles R. Orcutt (1864–1929) of San Diego made many collecting trips into NW Baja California between 1882 and 1919, at least nine of them into the Sierra Juárez, one in 1886 south beyond El Rosario, and one in 1899 across the peninsula from Santo Domingo to Santa Rosalía (DS, MO, US, &c.). Carl A. Purpus (1851–1941) collected from Santo Domingo to Calmallí and the Sierra San Francisco in 1898 and in the Cape region in 1900 and 1901 (UC) (Sousa Sánchez, 1969). Marcus E. Jones (1852–1934) made short trips in NW Baja California in 1882 and in 1923–1927; and between 1926 and 1930 he collected several times in Baja California Sur, including the Sierra de la Giganta and Sierra de la Laguna (POM) (Blake, 1945; Morton, 1945).

Among recent collectors, perhaps the most active have been Ira L. Wiggins (DS), Annetta Carter (UC), and Reid Moran (SD). Others who have added significantly to the grass records are Howard Scott Gentry (DES, LAM), John H. Thomas (DS), Alan A. Beetle (RM), Frank W. Gould (TAES),

¹ Herbarium abbreviations throughout are the standard ones from Holmgren and Keuken (1974).

Peta J. Mudie (SD), and John and Charlotte Reeder (ARIZ). With paved roads and easier access, many other botanists have visited Baja California in the last years; but their collections are scattered in many herbaria which we have not checked.

Earlier Accounts

Fournier (1886) treated the grasses of Mexico before much was known of Baja California. The first treatment with many references to Baja California was that of Hitchcock (1913) of the grasses of Mexico as represented in the U.S. National Herbarium. Based mainly on collections of Brandegee, Palmer, Orcutt, and Purpus, he cited 59 genera and 117 species from Baja California.

In his annotated list of grasses reported from Mexico, Beetle (1977a) specified Baja California for 120 species and 5 varieties and seemed to imply Baja California by more general statements for 92 others. However, Beetle (1977b) gave figures totaling 243 species and varieties for Baja California.

The first treatment of the grasses just of Baja California was that of Wiggins (1980), in the first Baja California flora. He treated 83 genera and 197 species as occurring in Baja California and two genera and 22 species as probably or possibly there. With a concise format, he keyed and described genera and keyed species but gave no synonyms, cited no specimens, and often gave only a very general statement of distribution in Baja California or sometimes none. His 87 line drawings of grasses show at least one species for each genus. For a review of this treatment, see Reeder and Reeder (1981).

Meanwhile, knowledge of grasses that occur in Baja California grew and was refined in treatments for nearby regions, including Hitchcock (1935a) for the United States, revised by Chase (1951); Gould (1951) for the southwestern United States and (1975) for Texas; Swallen (1951, revised 1964) for Arizona and (1955) for Guatemala; Munz and Keck (1959) for California and Munz (1974) for southern California; and Valdés Reyna (1977) for Chihuahua. Swallen and Hernández (1961) and Gould (1979) made keys to the genera of Mexican grasses. And Swallen (1964) treated the grasses of the Sonoran Desert, including the desert parts of Baja California.

Present Treatment

For the most part, our treatment is based on the publications mentioned above and certain monographs cited below and on the study of numerous

herbarium specimens at the California Academy of Sciences, the Dudley Herbarium of Stanford University (now at the California Academy of Sciences), the Universidad Nacional Autónoma de México, the Missouri Botanical Garden, the New York Botanical Garden, the San Diego Natural History Museum, the Tracy Herbarium of Texas A&M University, the University of California at Berkeley, and the United States National Herbarium. The original manuscript was chiefly the work of Gould, who in his study of Mexican grasses in general was collecting information on Baja Californian grasses in particular. Meanwhile, Moran was collecting grasses and information, more or less throughout Baja California and on all the islands but especially in the northwest region. Frank Gould died March 11, 1981, after an illness extending back to the previous summer.

Among the 197 species of grasses listed by Wiggins (1980) for Baja California are 26 for which we find no other Baja California record, including none in the Dudley Herbarium, where Dr. Wiggins' specimens are deposited. Some of the reports may reflect differences in identification, and some may be based on specimens in herbaria we have not checked. Without seeing specimens, we cannot evaluate these records. However, we include descriptions of most of these species and notes on various others.

We list only such synonyms as for some reason seem pertinent to this regional treatment, and we give references for synonyms only when they are based on Baja Californian types. We have few common names actually recorded in Baja California but give some Spanish and Mexican names from Rojas-Mendoza (1965). As with the English common names that we include, various of the specific ones seem contrived and unlikely to be met with in Baja California; so their usefulness may be questionable.

For grasses very common in Baja California, we may give only a general statement of range. For those that are more restricted but still commonly collected, we often cite enough localities to show the known range but do not cite individual collections. But for those known in Baja California from one or few collections, we commonly cite the collections. For any of which we have seen no specimens, we cite a reference to the literature. We generally include what information we have on elevations—though the fewer the specimens on which this is based, the less warranted the impression of precision that may sometimes result.

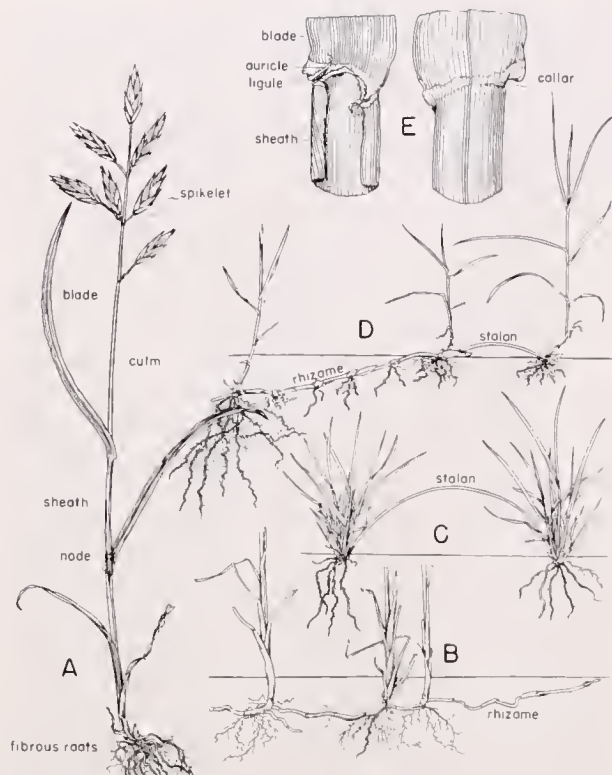


Fig. 2. Structure of grass plant: A, general habit (*Bromus unioloides*); B, rhizomes (*Hierochloë odorata*); C, stolon (*Hilaria belangeri*); D, rhizome and stolon intergradation (*Cynodon dactylon*); E, leaf at junction of sheath and blade; left, adaxial surface; right, abaxial surface. From Gould, 1951.

We give some order to what might otherwise be a jumble of often obscure place names by listing localities generally from north to south and from west to east and, where appropriate, grouping them by mountain ranges or other natural areas. Island occurrences we list separately. Since the northwest region and the Cape region are more or less distinct phytogeographically from desert parts of Baja California, it has often seemed practical to set off these areas in the statements of distribution. For the northwest region we have proportionally more records and Moran has more first-hand knowledge. Since the Cape region is less known and more difficult to delimit phytogeographically, we avoid this problem and refer to the Cape region in the usual geographical sense as the mostly mountainous area SE of the low isthmus between La Paz and Todos Santos.

At the risk of insulting practiced plant taxonomists, we include Figs. 2-4 to review grass terminology for others.

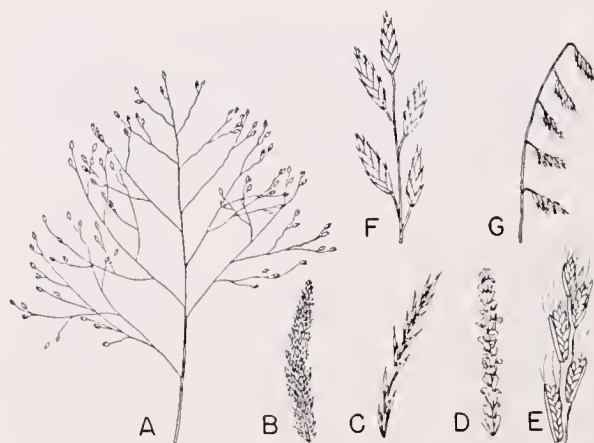


Fig. 3. Grass inflorescence: A, open panicle (*Panicum capillare*); B, spicate panicle (*Lycurus phleoides*); C, spicate raceme with sessile and short-pedicellate spikelets (*Andropogon*); D, spike with three spikelets at each node (*Hilaria*); E, spike with one spikelet at each node (*Lolium*); F, raceme (*Bromus unioloides*); G, unilateral raceme of spicate branches (*Bouteloua*). From Gould, 1951.

Acknowledgements

Lucile Gould has helped in many, many ways, of which typing and retyping manuscript and assembling illustrations were only the most mechanical and obvious; and we dedicate this memoir to her.

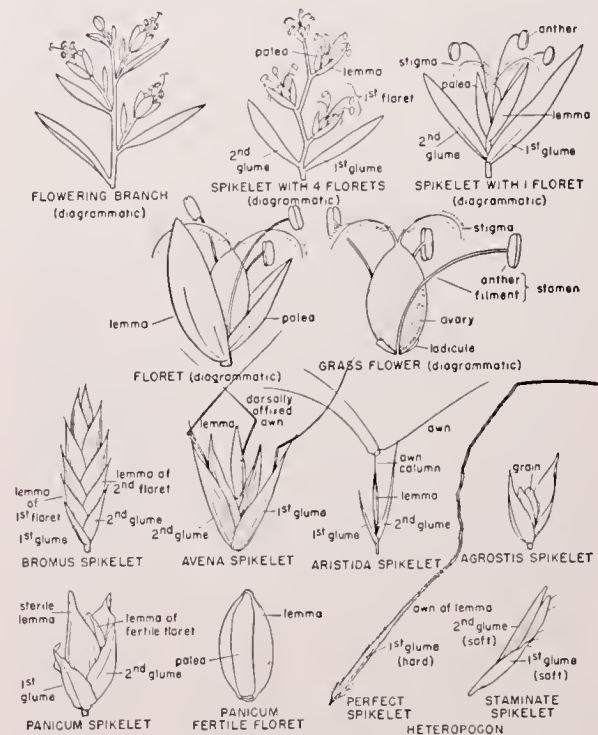


Fig. 4. Grass spikelets and florets. From Gould, 1951.

We thank Charlotte G. Reeder for her careful treatment of *Muhlenbergia* and for other help and Dr. Alan A. Beetle for his review of the manuscript. We thank Annetta Carter, Dr. Martin Cody, and Dr. Raymond M. Turner for suggestions for the introduction. And we thank Dr. Stephan L. Hatch for recent help and advice to the less agrostological member of the team.

We are grateful to the curators of the herbaria mentioned above for making their collections available to Gould during his visits. We further thank Dr. José Sarukhán, Director of the Instituto de Biología, Dr. Ernesto Moreno, Head of the Departamento de Botánica, and Dr. Mario Sousa, Curator of the Herbarium, Universidad Nacional Autónoma de México, for their many courtesies to Gould and for making time available to him for working on this manuscript.

Judy Farnsworth and Deanne Deméré did much of the typing. And Linda Allen, Claire Brey, and Duffie Clemons have helped with boring chores like proofreading. We thank them all.

We are grateful to the several artists, some old friends, who made our drawings for other works, little supposing them to be for this one. And we thank the following for kindly providing and allowing us to use these drawings (from the works

shown): University of Arizona Press (*Grasses of Southwestern United States*, 1951, by Frank W. Gould); Texas A&M University Press (*Grasses of the Texas Coastal Bend*, 1965, by Frank W. Gould and Thadis W. Box, and *The Grasses of Texas*, 1975, and *Common Texas Grasses*, 1978, both by Frank W. Gould); Hunt Institute for Botanical Documentation and particularly Mr. James J. White (*Manual of the Grasses of the United States*, 1935, by A. S. Hitchcock, and second edition, 1951, by Agnes Chase; *U.S.D.A. Bulletin*); Dr. Jason R. Swallen, Field Museum of Natural History, and Hunt Institute (*Grasses of Guatemala*, 1955, by Jason R. Swallen); Dr. Richard W. Pohl and Field Museum (*Flora costaricensis, Family Gramineae*, 1980, by Richard W. Pohl); Dr. Herbert L. Mason and University of California Press (*A Flora of the Marshes of California*, 1957, by Herbert L. Mason); the editor (MADroño). The source of each drawing is shown by author and year date. We particularly thank Takashi Ijichi for the sumi-e of *Distichlis palmeri* on the title page and Marie Cox for the map, both done just for this one.

Finally, we are grateful to each other for constant support and encouragement during this work, which neither could have done without the other, except possibly for Gould.

THE CLASSIFICATION: Subfamilies, Tribes, Genera

(With number of species described here)

Subfamily I. ORYZOIDEAE

Tribe 1. Oryzeae

1. *Leersia* (1)

Subfamily II. ARUNDINOIDEAE

Tribe 2. Arundineae

2. *Arundo* (1)
3. *Phragmites* (1)

Tribe 3. Danthoneae

4. *Schismus* (1)

Subfamily III. POOIDEAE

Tribe 4. Meliceae

5. *Melica* (2)

Tribe 5. Stipeae

6. *Stipa* (8)
7. *Oryzopsis* (1)
8. *Piptochaetium* (1)

Tribe 6. Poeae

9. *Bromus* (12)
10. *Brachypodium* (2)
11. *Vulpia* (4)
12. *Festuca* (1)
13. *Lolium* (2)
14. *Poa* (5)
15. *Lamarckia* (1)
16. *Briza* (1)
17. *Dactylis* (1)

Tribe 7. Aveneae

18. *Koeleria* (1)
19. *Sphenopholis* (1)
20. *Trisetum* (1)
21. *Avena* (3)
22. *Aira* (1)

- 23. *Deschampsia* (3)
- 24. *Peyritschia* (1)
- 25. *Holcus* (1)
- 26. *Dissanthelium* (1)
- 27. *Calamagrostis* (1)
- 28. *Agrostis* (6)
- 29. *Alopecurus* (2)
- 30. *Polypogon* (3)
- 31. *Phalaris* (6)
- 32. *Gastridium* (1)
- Tribe 8. Triticeae
 - 33. *Hordeum* (9)
 - 34. *Elymus* (5)
 - 35. *Triticum* (1)
 - 36. *Agropyron* (2)
 - 37. *Secale* (1)
- Tribe 9. Monermeae
 - 38. *Parapholis* (1)
 - 39. *Monerma* (1)
- Subfamily IV. ERAGROSTOIDEAE
 - Tribe 10. Eragrosteae
 - 40. *Eragrostis* (13)
 - 41. *Tridens* (1)
 - 42. *Erioneuron* (1)
 - 43. *Eleusine* (1)
 - 44. *Dactyloctenium* (1)
 - 45. *Leptochloa* (6)
 - 46. *Pereilema* (1)
 - 47. *Lycurus* (1)
 - 48. *Muhlenbergia* (22)
 - 49. *Sporobolus* (7)
 - 50. *Blepharoneuron* (1)
 - 51. *Crypsis* (2)
 - Tribe 11. Chlorideae
 - 52. *Cynodon* (1)
 - 53. *Microchloa* (1)
 - 54. *Chloris* (5)
 - 55. *Bouteloua* (11)
 - 56. *Aegopogon* (2)
 - 57. *Spartina* (1)
 - 58. *Hilaria* (5)
 - Tribe 12. Zoysieae
 - 59. *Tragus* (1)
 - Tribe 13. Aeluropodeae
 - 60. *Monanthochloë* (1)

- 61. *Distichlis* (2)
- 62. *Jouvea* (1)
- Tribe 14. Unioleae
 - 63. *Uniola* (1)
- Tribe 15. Pappophoreae
 - 64. *Pappophorum* (1)
 - 65. *Enneapogon* (1)
- Tribe 16. Orcuttieae
 - 66. *Orcuttia* (2)
- Tribe 17. Aristideae
 - 67. *Aristida* (14)
- Subfamily V. PANICOIDEAE
 - Tribe 18. Paniceae
 - 68. *Digitaria* (5)
 - 69. *Brachiaria* (3)
 - 70. *Eriochloa* (1)
 - 71. *Panicum* (7)
 - 72. *Dichanthelium* (1)
 - 73. *Stenotaphrum* (1)
 - 74. *Paspalidium* (1)
 - 75. *Paspalum* (8)
 - 76. *Lasiacis* (2)
 - 77. *Oplismenus* (2)
 - 78. *Echinochloa* (3)
 - 79. *Rhynchelytrum* (1)
 - 80. *Setariopsis* (1)
 - 81. *Setaria* (9)
 - 82. *Cenchrus* (6)
 - 83. *Antheophora* (1)
 - Tribe 19. Andropogoneae
 - 84. *Imperata* (1)
 - 85. *Saccharum* (1)
 - 86. *Sorghum* (2)
 - 87. *Andropogon* (1)
 - 88. *Bothriochloa* (1)
 - 89. *Schizachyrium* (3)
 - 90. *Trachypogon* (1)
 - 91. *Elyonurus* (1)
 - 92. *Heteropogon* (2)
 - 93. *Hackelochloa* (1)
 - 94. *Coix* (1)
 - 95. *Tripsacum* (1)
 - 96. *Zea* (1)

KEY TO GENERA

1. Leaf blades about 1 cm long; stoloniferous, mat-forming perennial with fascicled leaves and inconspicuous unisexual spikelets 60. *MONANTHOCHELOE*
p. 94
 1. Leaf blades more than 1 cm long.
 2. Spikelets unisexual; staminate and pistillate conspicuously different.
 3. Plants monoecious; staminate and pistillate spikelets on the same plant.
 4. Staminate and pistillate spikelets in separate inflorescences, the male terminal on culm, the female lateral 96. *ZEA*
p. 132
 4. Staminate and pistillate spikelets in same inflorescence, male above female.
 5. Pistillate spikelets enclosed in a bony, beadlike involucre 94. *COIX*
p. 131
 5. Pistillate spikelets not enclosed in a bony, beadlike involucre 95. *TRIPSACUM*
p. 132
 3. Plants usually dioecious; staminate and pistillate in separate inflorescences and usually on separate plants 62. *JOUEVA*
p. 96
 2. Spikelets not unisexual, or if so, then male and female not conspicuously different.
 6. Spikelets with single perfect floret, or if unisexual, then with a single pistillate floret A
 6. Spikelets with 2 or more perfect florets, or if unisexual then with 2 or more pistillate florets AA
- A (1 perfect floret)
7. Spikelets in pairs of 1 sessile or subsessile and 1 pediceled (2 pediceled at branch tips), all with a perfect floret or more commonly the pediceled spikelet staminate or neuter and usually reduced in size; first glume large and firm, enclosing margins of second glume; lemma of perfect floret thin, membranous, awned or less frequently awnless (tribe Andropogoneae) GROUP I
 7. Spikelets in pairs or not, when paired then pediceled spikelet not reduced and first glume not larger and firmer than lemma of perfect floret.
 8. Reduced floret or florets present below perfect one.
 9. Reduced floret 1; lemma of reduced floret similar to second glume in size and texture; disarticulation below glumes (tribe Paniceae) GROUP II
 9. Reduced florets 1 or 2; lemma of reduced floret not similar to second glume in size or texture; disarticulation above glumes GROUP III
 8. Reduced florets absent or present above fertile one.
 10. Inflorescence a panicle or open raceme, primary branches spreading or contracted GROUP III
 10. Inflorescence a spike or spicate raceme, or with 2 to several spicate branches.
 11. Inflorescence of 1 to several unilateral unbranched primary branches GROUP V
 11. Inflorescence a terminal bilateral spike or spicate raceme GROUP VI
- AA (2 or more perfect florets)
12. Inflorescence an open or contracted panicle, or a raceme with spikelets on well-developed pedicels GROUP IV
 12. Inflorescence a spike or spicate raceme, or with spicate primary branches.
 13. Inflorescence with 2 (infrequently 1) to several unilateral primary branches GROUP V
 13. Inflorescence a terminal, bilateral spike or spicate raceme GROUP VI

GROUP I (Tribe Andropogoneae)

14. Spikelets all alike and with perfect florets.
15. Spikelets awnless; panicles contracted, rarely over 3 cm thick 84. IMPERATA
p. 124
15. Spikelets awned; panicles much more than 3 cm thick 85. SACCHARUM
p. 125
14. Spikelets not all alike; pediceled ones, or less frequently sessile or subsessile ones, staminate or neuter.
16. Spikelets awnless.
17. Inflorescence a well-branched panicle 86. SORGHUM
p. 125
17. Inflorescence a spike or spicate raceme.
18. Rachis and pedicels pubescent 91. ELYONURUS
p. 130
18. Rachis and pedicels glabrous 93. HACKELOCHLOA
p. 131
16. Spikelets awned, the awn sometimes early deciduous.
19. Awn 3–8 cm long.
20. Perfect (awned) spikelets sessile; glumes and awns of perfect spikelet dark brown at maturity 92. HETEROPOGON
p. 130
20. Perfect spikelets pediceled; glumes and awns of perfect spikelet light-colored 90. TRACHYPOGON
p. 129
19. Awn less than 3 cm long.
21. Culms much-branched above, ending in numerous short leafy branches, each bearing 1–6 spikes or spicate inflorescence branches above uppermost leaf or bract.
22. Branchlets terminating in single spicate raceme 89. SCHIZACHYRIUM
p. 128
22. Branchlets terminating in small panicle of 2–6 delicate racemose flowering branches 87. ANDROPOGON
p. 126
21. Culms not much-branched above, terminating in large or small panicles.
23. Pedicels, at least those above, and usually upper rachis internodes, with central groove or membranous area 88. BOTHRIOCHLOA
p. 127
23. Pedicels and rachis internodes flat or rounded, without central groove or membranous area.
24. Panicle axis above lowermost branch usually 15–30 cm long, the lowermost branches freely rebranched and spreading 86. SORGHUM
p. 125
24. Panicle axis less than 15 cm long above lowermost branch, the lowermost branches contracted, spicate in appearance 87. ANDROPOGON
p. 126

GROUP II (Tribe Paniceae)

25. Spikelets in clusters of 4, the indurate first glumes united below to form a bur; burs disarticulating separately from a persistent rachis 83. ANTHERPHORA
p. 124
25. Spikelets not in deciduous clusters of 4.
26. Spikelets subtended or surrounded by 1–several separate or united bristles and/or flattened spines.
27. Bristles solitary or several and separate, persistent when spikelets fall.

28. Second glume 11–15-nerved, enlarged, thin, saccate, irregularly auriculate; bristles
1 below each spikelet 80. SETARIOPSIS
p. 118
28. Second glume 5–9-nerved, not enlarged, thin, saccate, or auriculate; bristles
1–several below each spikelet 81. SETARIA
p. 119
27. Bristles and spines united at base or above to form involucre or bur that falls with
enclosed spikelet or spikelets 82. CENCHRUS
p. 122
26. Spikelets not subtended or surrounded by bristles or spines.
29. Inflorescence with spikelets partially embedded in thick flattened rachis
..... 73. STENOTAPHRUM
p. 110
29. Inflorescence with spikelets not embedded in rachis.
30. First or second glume distinctly awned.
31. First glume minute; second glume and lemma of lower floret silky-villous
..... 79. RHYNCHELYTRUM
p. 118
31. First glume well developed; spikelets not silky-villous.
32. First glume with an awn 3 times as long as body 77. OPLISMENUS
p. 115
32. First glume awnless or awn shorter than body 78. ECHINOCHLOA
p. 116
30. First and second glumes awnless.
33. Lemma of fertile floret with thin, flat margins, these not inrolled over palea
margins 68. DIGITARIA
p. 104
33. Lemma of fertile floret with thick margins, these inrolled over palea margins.
34. First glume absent from some or all spikelets B
34. First glume present on all spikelets BB

B

35. Lemma of fertile floret mucronate or short-awned; cup-like or disc-like ring present at base of
spikelet 70. ERIOCHLOA
p. 107
35. Lemma of fertile floret not mucronate or awned; cup-like or disc-like ring not present at base of
spikelet 75. PASPALUM
p. 112

BB

36. Inflorescence with some or all primary branches rebranched, or if not, then first glume about as
long as second glume and lemma of floret.
37. Culms somewhat woody, freely branched above; lemma and palea of upper floret with minute
tufts of hair at tips 76. LASIACIS
p. 114
37. Culms not woody or freely branched above; lemma and palea of upper floret glabrous.
38. Tip of lemma and palea of upper floret abruptly pointed; tip of palea free from lemma
..... 78. ECHINOCHLOA
p. 116
38. Tip of lemma and palea of upper floret rounded or slightly beaked; tip of palea enclosed
by lemma.
39. Plants annual.
40. Lemma and palea of upper floret smooth 71. PANICUM
p. 108

40. Lemma and palea of upper floret rugose 69. *BRACHIARIA*
p. 106
39. Plants perennial.
41. Panicles 12–40 cm or more long; plants tall, often 60–100 cm tall .. 71. *PANICUM*
p. 108
41. Panicles mostly 5–9 cm long; plants low, tufted, with culms mostly 20–50 cm
tall 72. *DICHANTHELIUM*
p. 110
36. Inflorescence of 2 to several spicate unbranched primary branches; spikelets in regular rows;
first glume much shorter than second glume and lemma of lower floret.
42. Second glume and lemma or lower floret scabrous or pubescent 78. *ECHINOCHLOA*
p. 116
42. Second glume and lemma of lower floret glabrous.
43. Culm nodes glabrous 74. *PASPALIDIUM*
p. 111
43. Culm nodes, at least the lower, villous pubescent 69. *BRACHIARIA*
p. 106
- GROUP III (Panicle with rebranched primary branches; perfect floret 1)
44. Glumes and lemmas awnless.
45. Glumes absent; lemma firm, boat-shaped 1. *LEERSIA*
p. 21
45. Glumes, at least the second, well-developed; lemma not boat-shaped.
46. Nerves of lemma densely villous 50. *BLEPHARONEURON*
p. 81
46. Nerves of lemma not villous.
47. Glumes both as long as or longer than lemma (the first sometimes slightly shorter
in *Crypsis*).
48. Ligule a fringe of hairs; low mat-forming annual 51. *CRYPISIS*
p. 82
48. Ligule a membrane; plants not mat-forming.
49. Glumes not sharply keeled; no floret rudiments present below perfect floret
..... 28. *AGROSTIS*
p. 43
49. Glumes sharply keeled; 1 or 2 scale-like rudiments present below perfect
floret 31. *PHALARIS*
p. 48
47. Glumes, at least the first, shorter than lemma.
50. Lemma 3-nerved 48. *MUHLENBERGIA*
p. 67
50. Lemma 1-nerved 49. *SPOROBOLUS*
p. 78
44. Glumes or lemma awned.
51. Spikelets in fascicles, the terminal spikelet of each fascicle with a single perfect floret and
awned rudiment, the spikelets below with several empty lemmas 15. *LAMARCKIA*
p. 37
51. Spikelets not as above.
52. Spikelets subtended by bristles; lemma long-awned 46. *PEREILEMA*
p. 66
52. Spikelets not subtended by bristles; lemma awned or awnless.
53. First glume usually 2–3-awned; second glume usually 1-awned; spikelets in pairs,
the lower of pair neuter, the two falling together 47. *LYCURUS*
p. 66
53. First glume not as above, or if so, then spikelets not falling in pairs.
54. Glumes both with awns exceeding body in length 30. *POLYPOGON*
p. 47

54. Glumes awnless or awns shorter than body.
55. Spikelets with 1 perfect floret and 1 staminate above; glumes exceeding florets; upper lemma with yellowish hooked awn from back near apex 25. *HOLCUS*
p. 43
55. Spikelets with 1 perfect floret and no reduced or rudimentary florets.
56. Lemma indurate, awned, with well-developed callus at base, permanently enclosing palea and caryopsis.
57. Awn of lemma 3-branched (lateral branches short or rudimentary in a few species) 67. *ARISTIDA*
p. 99
57. Awn of lemma unbranched.
58. Awn straight or curved but not twisted, rarely more than 2–4 times as long as body of lemma, early deciduous; body of lemma broad, usually subglobose, with short blunt callus 7. *ORYZOPSIS*
p. 26
58. Awn twisted and geniculate, usually several to many times as long as body of lemma, persistent or finally disarticulating.
59. Margins of lemma not meeting at apex; exposed tip of palea projecting as a point; awn 1–2 cm long; floret subglobose, with short callus at base 8. *PIPTOCHAETIUM*
p. 26
59. Margins of lemma meeting or overlapping; tip of palea not exposed; awn 1.5–15 cm or more long; sharp-pointed, bearded callus at base 6. *STIPA*
p. 23
56. Lemma not indurate or permanently enclosing palea and caryopsis.
60. Second glume 4–5 times as long as lemma; annual with densely contracted panicle 32. *GASTRIDIDIUM*
p. 50
60. Second glume shorter to slightly longer than lemma; annuals and perennials with contracted or open panicles.
61. Lemma awned from back or base.
62. Rachilla prolonged behind palea; palea equalling lemma; stout rhizomatous perennial 27. *CALAMAGROSTIS*
p. 43
62. Rachilla not prolonged; palea shorter than lemma or often absent; annual or perennial.
63. Glumes glabrous or scabrous; disarticulation above glumes 28. *AGROSTIS*
p. 43
63. Glumes soft-hairy on back; disarticulation below glumes 29. *ALOPECURUS*
p. 46
61. Lemma awned from apex 48. *MUHLENBERGIA*
p. 67

GROUP IV

(Panicle with rebranched primary branches; fertile florets 2 or more)

64. Plants 2–6 meters tall.
65. Lemmas villous, rachilla glabrous 2. *ARUNDO*
p. 21

65. Lemmas glabrous, rachilla villous 3. PHRAGMITES
p. 22
64. Plants less than 2 meters tall.
66. Lemmas 3-nerved.
67. Nerves of lemma glabrous; lemmas never awned or mucronate 40. ERAGROSTIS
p. 56
67. Nerves of lemma hairy or puberulent, at least below; nerves often extended as mucros
or short awns.
68. Panicles 1–3 cm long, ovoid or oblong; lemmas cleft to middle, awned
..... 42. ERIONEURON
p. 62
68. Panicles mostly 7–25 cm long, slender; lemmas obtuse to emarginate, awnless
..... 41. TRIDENS
p. 61
66. Lemmas 5–13-nerved.
69. Lemma with 5 or more awns.
70. Lemmas with 5 awns or awnlike lobes; ligules absent; annuals 66. ORCUTTIA
p. 97
70. Lemmas with more than 5 awns; ligule a ring of hairs; perennials.
71. Awns per lemma 9, subequal, plumose 65. ENNEAPOGON
p. 97
71. Awns per lemma 11 or more, unequal, glabrous or scabrous
..... 64. PAPPOPHORUM
p. 97
69. Lemma with single awn or awnless.
72. Glumes 2 cm or more long; lemmas 1.5 cm or more long 21. AVENA
p. 40
72. Glumes less than 2 cm long, or if this long then lemmas less than 1.5 cm long.
73. Lemma awned from back or base.
74. Rachilla prolonged beyond back of upper floret, with hairs 1 mm or more
long 23. DESCHAMPSIA
p. 41
74. Rachilla not prolonged beyond insertion of upper florets, with hairs less
than ½ mm long.
75. Plant a delicate annual, with leaves basal; panicle open 22. AIRA
p. 41
75. Plant perennial, with leaves well distributed; panicle contracted
..... 24. PEYRITSCHIA
p. 42
73. Lemma awned from apex or awnless.
76. First glume much longer than lowermost floret; lemmas awnless or minutely
mucronate.
77. Spikelets mostly 2-flowered 26. DISSANTHELIUM
p. 43
77. Spikelets mostly 4–6-flowered 4. SCHISMUS
p. 22
76. First glume about as long as or shorter than lower floret.
78. Margins of leaf sheaths connate, at least below.
79. Palea free from caryopsis; plants perennial 5. MELICA
p. 23
79. Palea adherent to caryopsis; plants annual or perennial 9. BROMUS
p. 27
78. Margins of leaf sheaths not connate, free to base.
80. Lemmas awned.
81. Spikelets 2-flowered; lemma awned from deeply bifid apex
..... 20. TRISETUM
p. 39

- 81. Spikelets mostly 3–9-flowered; lemma awned from entire apex.
- 82. Spikelets laterally compressed, more or less asymmetrical, subsessile in dense clusters at tips of stiff erect or spreading branches; glumes and lemmas acute or irregularly short-awned; perennial 17. DACTYLIS
p. 38
- 82. Spikelets not laterally compressed or asymmetrical, not in dense clusters at branch tips.
- 83. Plants annual 11. VULPIA
p. 32
- 83. Plants perennial 12. FESTUCA
p. 34
- 80. Lemmas awnless.
- 84. Lowermost 2 florets reduced, sterile; disarticulation below glumes; plants to 2 m tall, stoloniferous 63. UNIOLA
p. 96
- 84. Lowermost florets not reduced; disarticulation above or below glumes; plants rarely to 1 m tall.
- 85. Glumes and lemmas spreading at right angles to rachilla, inflated and papery; spikelets like rattlesnake rattles, on slender pedicels 16. BRIZA
p. 38
- 85. Glumes and lemmas not as above.
- 86. Palea colorless; lateral nerves of lemma indistinct.
- 87. Second glume obovate, usually abruptly narrowing to obtuse or broadly acute apex; disarticulation below glumes 19. SPHENOPHOLIS
p. 39
- 87. Second glume not broadened above middle or only slightly so, acute at apex; disarticulation above glumes 18. KOELERIA
p. 38
- 86. Palea green or brown, at least on nerves.
- 88. Lemmas thick, indistinctly 9–11-nerved; flowers unisexual; rhizomatous perennials of saline habitats 61. DISTICHLIS
p. 94
- 88. Lemmas thin, 5-nerved; flowers mostly perfect; tufted annuals and perennials of other habitats 14. POA
p. 36

GROUP V (Panicle with unbranched primary branches)

- 89. Glumes with hooked spines 59. TRAGUS
p. 93
- 89. Glumes without hooked spines.
- 90. Inflorescence branches paired, digitate, whorled or clustered near apex of culm.
- 91. Glumes and lemmas awnless.
- 92. Spikelets with one floret (occasionally a vestigial rudiment above) 52. CYNODON
p. 82
- 92. Spikelets with 3 to several florets 43. ELEUSINE
p. 62
- 91. Glumes or lemmas, at least those of rudimentary florets, awned or mucronate.
- 93. Spikelets with 3 or more fertile florets; rachis of inflorescence branch extended as stiff projection beyond terminal spikelets 44. DACTYLOCTENIUM
p. 63

93. Spikelets with 1 fertile floret and 1–3 rudiments above; rachis of inflorescence branch not extended as stiff projection beyond terminal spikelets 54. *CHLORIS*
p. 83
90. Inflorescence branches scattered on main axis, not paired, digitate or whorled.
94. Spikelets with single floret and no rudiments; lemmas awnless 57. *SPARTINA*
p. 92
94. Spikelets with 2 or more florets.
95. Lemmas awnless 34. *ELYMUS*
p. 53
95. Lemmas, at least those of upper florets, awned.
96. Spikelets with single perfect floret.
97. Plants annual, delicate; spikelets in deciduous clusters of 3, the lower 2 spikelets staminate or sterile 56. *AEGOPOGON*
p. 90
97. Plants annual or perennial, when annual then spikelets not in deciduous clusters of 3 with lower 2 spikelets staminate or sterile 55. *BOUTELOUA*
p. 86
96. Spikelets with 2 or more perfect florets 45. *LEPTOCHLOA*
p. 64

GROUP VI (Spike or spicate raceme)

98. Inflorescence capitate; glumes much longer than lemmas; lemmas densely long-pilose below 42. *ERIONEURON*
p. 62
98. Inflorescence not capitate; glumes not as long as lemmas or if so then lemmas not long-pilose.
99. Spikelets with single floret.
100. Spikelets single at each node.
101. Spikelets 6–8 mm long.
102. First glume present, the 2 glumes paired in front of spikelet 38. *PARAPHOLIS*
p. 55
102. First glume absent except on terminal spikelet 39. *MONERMA*
p. 55
101. Spikelets 2.5–3.5 mm long 53. *MICROCHLOA*
p. 83
100. Spikelets 3 at each node 33. *HORDEUM*
p. 50
99. Spikelets with 2 or more florets.
103. Lemmas conspicuously 11–15-nerved; low annuals 66. *ORCUTTIA*
p. 97
103. Lemmas 1–7-nerved.
104. Rachis with mostly 2 or more spikelets per node.
105. Spikelets disarticulating in clusters from persistent rachis 58. *HILARIA*
p. 92
105. Spikelets disarticulating above glumes or with sections of rachis 34. *ELYMUS*
p. 53
104. Rachis with all or mostly 1 spikelet per node.
106. Spikelets oriented edgewise to rachis; first glume absent on all but terminal spikelet 13. *LOLIUM*
p. 35
106. Spikelets not oriented edgewise; first glume present on all spikelets.
107. Spikelets unisexual, the male and female in different inflorescences; plants rhizomatous and with thick, usually involute blades.
108. Spikelets sessile 62. *JOUEVA*
p. 96

108. Spikelets short-pediceled 61. *DISTICHLIS*
p. 94
107. Spikelets perfect; plants rhizomatous or not; blades thin and flat.
109. Spikelets short-pediceled 10. *BRACHYPODIUM*
p. 31
109. Spikelets sessile.
110. Plants annual; glumes thick, indurate.
111. Glumes narrow, rigid, setaceous; lemmas long-awned
..... 37. *SECALE*
p. 55
111. Glumes not setaceous, broadened at or above base
..... 35. *TRITICUM*
p. 54
110. Plants perennial; glumes thin when broad.
112. Glumes narrow, tending to be subulate; lemmas awn-
less or with awns to 6 mm long 34. *ELYMUS*
p. 53
112. Glumes flat and relatively broad; lemmas with awn 8-
20 mm long 36. *AGROPYRON*
p. 54

SYSTEMATIC ACCOUNT

Subfamily I. ORYZOIDEAE

Tribe 1. Oryzeae

1. *Leersia* Sw.

1. *Leersia oryzoides* (L.) Sw., Prod. Veg. Ind. Occ. 21. 1788. RICE CUTGRASS. Perennial with culms mostly 80–150 cm tall or long from slender creeping rhizomes, the culm bases often decumbent and spreading. *Nodes* retrorsely hispid. *Sheaths* and blades usually strongly retrorsely scabrous, the margins and blade midnerve sharply serrate. *Ligules* membranous, short, firm, truncate. *Blades* mostly 7–10 mm broad, thin but firm. *Panicle* lax, drooping, mostly 10–20 cm long; long lower branches bare of spikelets for basal 1.5–4 cm. *Spikelets* subsessile, 1-flowered, laterally compressed, awnless, narrowly oblong, asymmetrical, 4.5–5 mm long, 1.5–2 mm broad. *Lemma and palea* short-hispid or scabrous, bristly-ciliate with stiff hairs on keels.

Widespread in North America, from southern Canada to northern Mexico, in moist or wet soils along streams, lakes, and swales. BAJA CALIFORNIA: Reported by Wiggins (1980:929) as weedy but uncommon, along banks of streams and irrigation ditches. We have seen no specimens.

Subfamily II. ARUNDINOIDEAE

Tribe 2. Arundineae

2. *Arundo* L.

1. *Arundo donax* L., Sp. Pl. 81. 1753. CARRIZO, GIANT REED. Fig. 5. Stout perennial with culms 2–6 m tall, in large clumps or colonies from thick knotty rhizomes. *Leaves* glabrous, rather uniformly spaced and distichous on culm, the blades mostly 4–7 cm broad. *Inflorescence* a dense contracted panicle 30–60 cm long. *Spikelets* 10–15 mm long, mostly 2–4-flowered, with glabrous rachilla. Disarticulation at nodes of rachilla. *Glumes* nearly equal, thin, 3–several-nerved. *Lemmas* thin, 3–5-nerved, 5–10 mm long, densely soft-hairy, acuminate or short-awned.

An Old World reed widely introduced in southern USA and northern Mexico; in Baja California mostly below 800 m. BAJA CALIFORNIA NORTE: Commonly planted and persisting along NW coast and naturalized locally in arroyos (Rosarito; Rancho Cuevas; Ensenada; Eréndira; Río Santo Domingo); desert canyons at E base of Sierra Juárez (Cañón Tajo) and Sierra San Pedro Mártir (Arroyo Agua Caliente); W of Bahía de los Angeles. BAJA CALIFORNIA SUR: Mulegé; Sierra de la Giganta (Cerro la Giganta); San José del Cabo.



Fig. 5. *Arundo donax*: plant, floret, spikelet. From Hitchcock, 1935.

3. *Phragmites* Trin.

1. *Phragmites australis* (Cav.) Trin. ex Steud., Nom. Bot. ed. 2, 2:324. 1841. *P. phragmites* (L.) Karst. *P. communis* Trin. Fig. 6. Stout perennial with culms 2–4 m tall from thick rhizomes. *Blades* glabrous, elongate, those of main culms mostly 1.5–5 cm broad. *Inflorescence* a large densely flowered contracted panicle. *Spikelets* 10–15 mm long, usually with 4–8 florets. *Rachilla joints* villous, the glumes, lemmas and paleas glabrous. Disarticulation at nodes of rachilla. *Glumes* 3-nerved or second 5-nerved, acute or mucronate; first glume $\frac{1}{2}$ – $\frac{2}{3}$ as long as second. *Lower floret* infertile, with 3-nerved lemma much longer than lemmas of upper florets.

Widespread in temperate and tropical regions of the world, in marshes and on borders of streams



Fig. 6. *Phragmites australis*: a, floret; b, spikelet; c, panicle and upper part of culm; d, grain. From Mason, 1957.

and lakes, often in shallow water. In Baja California mostly below 400 m. BAJA CALIFORNIA NORTE: Desert canyons at E base of Sierra Juárez (grade below Rumorosa; Cañón Tajo). BAJA CALIFORNIA SUR: La Trinidad; San Ignacio; Santa Águeda; Comondú; La Paz; San Pedrito; Sierra de Santiago.

Both *Phragmites australis* and *Arundo donax* are tall reeds that grow in moist or wet places. They may readily be separated by spikelet differences: *P. australis* has glabrous lemmas and a hairy rachilla, whereas *A. donax* has hairy lemmas and a glabrous rachilla.

Tribe 3. Danthonieae

4. *Schismus* Beauv.

1. *Schismus barbatus* (L.) Thell., Bull. Herb. Boissier, Ser. 2, 7:391. 1907. Fig. 7. Low tufted short-lived annual, with glabrous or sparsely hirsute herbage. *Blades* flat, soft. *Inflorescence* a dense contracted panicle 1–6 cm long. *Spikelets* mostly 5–7-flowered. *Glumes* about equal and much longer than lemmas. *Lemmas* broad, rounded on back,

several-nerved, glabrous or sparsely hairy, mostly 2–2.5 mm long, with minutely notched and often mucronate apex.

Adventive from the Mediterranean region; now widespread in SW USA and NW Mexico, commonly in sandy soils of arroyo beds and flat valley floors and on grassy hillsides. BAJA CALIFORNIA NORTE: abundantly naturalized in the NW, from sea level to 1100 m, and occasional in Sierra San Pedro Mártir to 1700 m; southward in desert to ex-misión San Borja.

Subfamily III. POOIDEAE

Tribe 4. Meliceae

5. *Melica* L.

Tufted moderately tall perennials, without rhizomes or stolons but often with swollen corm-like bases. *Leaf sheath* margins fused together to or nearly to apex. *Inflorescence* a densely contracted or somewhat open panicle. *Spikelets* 2–6-flowered, the terminal floret or florets neuter, often reduced to a rudiment. *Glumes* large, broad, thin, 3–5-nerved, with hyaline or papery margins. *Lemmas* firmer than glumes, rounded on back, usually 7-nerved, with hyaline margins.

- | | |
|---|-------------------------|
| 1. Perfect florets 1–2; palea as long as lemma | 1. <i>M. imperfecta</i> |
| 1. Perfect florets more than 2; palea usually about half as long as lemma | 2. <i>M. frutescens</i> |

1. *Melica imperfecta* Trin., Mem. Acad. Imp. Sci. St.-Petersbourg, Ser. 6, Sci. Math. 2:59. 1836. *Culms* to 110 cm tall. *Blades* 1–6 mm broad. *Panicles* mostly 10–30 cm long, with erect-appressed or spreading branches. *Spikelets* 3.5–7 mm long, with 1, occasionally 2, perfect florets and an obtuse-oblong rudiment 0.5–4 mm long. *Glumes* nearly equal, usually shorter than lowermost floret. *Lemma* of lowermost floret 3–7 mm long.

North-central California to Baja California, frequent and variable on dry rocky slopes, in sage scrub, chaparral, and open woodland. BAJA CALIFORNIA NORTE: Widespread but not abundant in the NW, from sea level to 1650 m, south near coast to El Consuelo; southward in mountains (Cerro San Juan de Dios, 1125 m; Cerro Matomí, 1600 m; Sierra San Luis, ±1100 m; Sierra San Borja, 1600 m); Islas Todos Santos, San Martín, Guadalupe, and Cedros. BAJA CALIFORNIA SUR: Cerro Azufre, 1650 m.

2. *Melica frutescens* Scribn., Proc. Acad. Nat. Sci. Philadelphia 37:45. 1885. Fig. 8. *Culms* to 1.5 m or



Fig. 7. *Schismus barbatus*: plant, spikelet, floret. From Gould, 1951.

more tall but usually much shorter. *Blades* 2–4 mm broad. *Panicles* dense, narrow, mostly 12–35 cm long, pale and shiny or rarely purple-tinged. *Spikelets* 12–18 mm long, with 3–6 perfect florets. *Glumes* papery, the first 7–12 mm long, the second 9–15 mm long. *Lemmas* usually obtuse, the upper $\frac{1}{3}$ papery-scarious; lowermost lemma 8–11 mm long. *Rudiment* 4.5–6.5 mm long, consisting of empty lemma enclosing a globose terminal rudimentary floret.

South-central Arizona and southern California to Baja California, on dry rocky slopes. BAJA CALIFORNIA NORTE: Occasional in the NW below 1100 m and southward in desert (Cerro San Juan de Dios, 900 m; Cerro Matomí, 1150 m; S of Santa Catarina; Sierra San Luis, 1300 m; Rosarito, 75 m; Sierra San Borja, 1200 m); Islas Cedros (575 m) and Ángel de la Guarda (500–1100 m). BAJA CALIFORNIA SUR: Cerro Azufre, 1375 m; Volcán las Tres Vírgenes, 1275–1750 m; Picachos de Santa Clara, 475 m.

Tribe 5 Stipeae

6. *Stipa* L.

Cespitose perennials with rounded sheaths and long narrow mostly involute blades. *Inflorescence* a contracted or somewhat open panicle of 1-flow-

ered awned spikelets. *Glumes* thin, 3-several-nerved, longer than body of lemma. *Lemmas* firm or hard, elongate, usually terete, tightly enclosing the membranous palea and flower or caryopsis, with terminal awn. *Lemma awn* commonly geniculate and twisted, persistent or in a few species at length deciduous. *Base of lemma and rachilla* forming pointed callus usually bearded with stiff hairs.

1. First segment of awn plumose with hairs 5–8 mm long; panicles contracted, usually densely-flowered 1. *S. speciosa*
1. First segment of awn not plumose or if so then hairs 2 mm or less long; panicles contracted or open.
2. Lemmas villous to base, the hairs at summit 3–4 mm long 2. *S. coronata*
2. Lemmas pubescent or glabrous, the hairs at summit not more than 2 mm long.
3. Culms with conspicuous ciliate bract 4–6 mm long below panicle 3. *S. bracteata*
3. Culms without ciliate bract below panicle.
4. Panicle contracted, narrow, the branches usually stiffly erect.
5. Spikelets 3.5–4 mm long; palea $\frac{1}{3}$ or less as long as lemma 6b. *S. lepida* var. *andersonii*
5. Spikelets 5.5 mm or more long; palea more than $\frac{1}{3}$ as long as lemma.
6. Lemmas symmetrical, 5.5–7 mm long, with silvery hairs 4. *S. diegoensis*
6. Lemmas asymmetrical at apex, 7.5–9 mm long, with brownish hairs 5. *S. pringlei*
4. Panicles typically open at maturity and with relatively long slender spreading or drooping branches, but branches often erect on immature inflorescences; palea $\frac{1}{3}$ or less as long as lemma.
7. Awns mostly 2.5–4 cm long; lemmas 4–6.5 mm long 6a. *S. lepida* var. *lepida*
7. Awns mostly 5–11 cm long; lemmas 6–12 mm long.
8. Middle culm blades 1.2–2.4 mm broad; lemmas slender, 6–8 mm long; terminal awn segment slender and flexuous 8. *S. cernua*
8. Middle culm blades 2.4–6 mm broad; lemmas thick, fusiform, 7.5–12 mm long; terminal awn segment stiff and straight 7. *S. pulchra*

1. *Stipa speciosa* Trin. & Rupr., Mem. Acad. Imp. Sci. St.-Petersbourg, Ser. 6, Sci. Math. 5:45. 1842. *S. californica* Vasey ex S. Wats., Proc. Amer. Acad. Arts 24:80. 1889. Nomen nudum. DESERT NEEDLEGRASS. *Culms* in dense clumps, mostly 30–60 cm tall. Lowermost *sheaths* shiny and long-persistent. *Ligule* short, densely ciliate. *Blades* firm, narrow, mostly tightly involute, 15–30 cm long. *Panicles* dense, often partially included in upper sheath, mostly 6–15 cm long. *Glumes* nearly equal, about 15 mm long. *Lemmas* 7–10 mm long, uniformly short pubescent on body and with slightly longer hairs on callus. *Awn* sharply once-genicu-

late, the lower segment 1–2 cm long, plumose with long hairs, the upper segment 1.5–2.5 cm long.

Colorado to Arizona, southern California, and Baja California; also South America. On dry ridges, slopes, and bluffs, in Baja California mostly in open pine, juniper, or desert scrub vegetation. BAJA CALIFORNIA NORTE: Sierra Juárez, 900–1600 m; Sierra San Pedro Mártir, 875 m; N of San Quintín; Cerro San Juan de Dios, 900 m; Cerro Matomí, 1600 m; Cerro Potrero, 1400 m; Sierra San Luis, 1200–1300 m; Sierra San Borja, 1000–1800 m; Isla Ángel de la Guarda, 500–1000 m. BAJA CALIFORNIA SUR: Cerro Azufre, 1650 m; Volcán las Tres Vírgenes, 1675 m.

Stipa californica Vasey was based on Palmer 505, from "mountain cañons about Los Angeles Bay".

2. *Stipa coronata* Thurb. in S. Wats., Bot. Calif. 2:287. 1880. *S. parishii* Vasey. *S. coronata* var. *depauperata* (Jones) Hitchc. *Culms* usually in large clumps from firm base, typically 1–2 m tall but as short as 50 cm on depauperate plants and secondary shoots. *Blades* long, 3–7 mm broad, flat below but usually with long narrow involute tips. *Panicles* dense, contracted, mostly 20–50 cm long, pale green or purple-tinged. *Second glume* 13–18 cm long, the first shorter. *Lemmas* 7.5–9 mm long, densely villous with hairs 2–4 mm long; awn 3.5–5 cm long, scabrous, weakly twice-geniculate.

Coast ranges of southern California to Baja California, on dry rocky slopes in chaparral, piñon-juniper woodland, and pine forest. BAJA CALIFORNIA NORTE: Occasional on NW coast (Descanso) and in foothills; Cerro Guadalupe, 1100–1200 m; Sierra Juárez, 1000–1600 m; Sierra San Pedro Mártir, 1400–2000 m; Cerro Matomí, 1150 m; Sierra San Luis, 1200 m; Cerro Santa Marta, Sierra San Borja, 1500 m.

Some collections of *S. coronata* have been identified as var. *depauperata* (Jones) Hitchc., but the plants of our area do not appear to comprise two recognizably different taxa.

3. *Stipa bracteata* Swallen, J. Wash. Acad. Sci. 30:213. 1940. *Culms* tufted, erect, 3-noded, to 125 cm tall, retrorsely pubescent below nodes, with conspicuous ciliate bract 4–6 mm long below panicle. *Sheaths* shorter than internodes, pubescent near base, sparsely pilose at throat. *Blades* 25–40 cm long, 1–3 mm broad, flat or involute, pubescent on upper surface, glabrous on lower. *Panicles* 35–42 cm long, lax, the branches 4–10 cm long in remote fascicles, naked at base, the spikelets appressed. *Glumes* hyaline, acuminate, 3-nerved, the

first 10–11 mm long, the second ca. 2 mm shorter. *Lemmas* 5.5–6.5 mm long, fusiform, brown, pilose with white appressed hairs; awn 20–24 mm long, twice geniculate, glabrous or nearly so, the lower segments twisted, the upper straight.

Endemic to Baja California. BAJA CALIFORNIA NORTE: Apparently known only from the type collection (Wiggins 5153), from "grassy flats 25 miles north of Ensenada, Baja California, April 4, 1931". Presumably this would be on the volcanic Mesa de Tigre, southeast of La Misión.

Stipa bracteata is close to *S. diegoensis*, and more material is needed for proper evaluation.

4. *Stipa diegoensis* Swallen, J. Wash. Acad. Sci. 30:213. 1940. *Culms* densely tufted, 70–100 cm tall, pubescent below nodes. *Blades* 2–4 mm broad, flat or involute, scabrous on abaxial surface, pubescent on adaxial surface. *Panicles* 15–30 cm long, narrow, dense, with appressed branches to 10 cm long. *First glume* 9–10 mm long, the second slightly shorter. *Lemmas* brownish at maturity, 5.5–7 mm long, pilose with silvery hairs, the hairs at apex 1–2 mm long; awns mostly 2–3.5 cm long, twice-geniculate. *Palea* thin, membranous, 3–4 mm long.

San Diego Co., California, and northern Baja California, with chaparral and coastal sage scrub. BAJA CALIFORNIA NORTE: Occasional on rocky slopes below 750 m, S to Agua de Tánilo, E of Santa María.

5. *Stipa pringlei* (Beal) Scribn. in Vasey, Contr. U.S. Natl. Herb. 3:54. 1892. PRINGLE NEEDLE-GRASS. *Culms* 40–100 (–120) cm tall, often pubescent at nodes. *Blades* firm, scabrous, long, linear, mostly 1–3 mm broad. *Panicles* 8–15 (–20) cm long, with relatively few large purplish spikelets on slender contracted branches, the lower branches occasionally spreading or drooping. *Glumes* subequal, 5–9-nerved, 8–10 mm long. *Lemmas* plump, finely rugose, dark brown at maturity; awns scaberulous, mostly 2–3 cm long, weakly twice-geniculate. *Paleas* firm, shiny, as long as lemmas.

Arizona and Texas to Baja California and Chihuahua, mostly in pine forest or chaparral at high elevations. BAJA CALIFORNIA NORTE: Occasional on rocky slopes in Jeffrey pine forest at 2100–2600 m, Sierra San Pedro Mártir (Cerro Venado Blanco, Yerba Buena, Vallecitos, N of Rancho Viejo).

6. *Stipa lepida* Hitchc., Amer. J. Bot. 2:302. 1915. *Culms* slender, puberulent below nodes. *Blades* flat, involute, or folded, 1–3 mm broad. *Glumes* 3-nerved, the first 6–10 mm long, the second slight-

ly shorter. *Lemmas* minutely papillose, 3.5–6 mm long, brown at maturity, sparsely villous, usually with ring of hairs at apex. *Lemmas* awn 2.5–4 cm long, indistinctly twice-geniculate. *Palea* membranous, 1/3 or less as long as lemma.

1. Leaf blades flat or folded, at least some 1.5 mm or more broad; inflorescence mostly 12–20 cm long, the lower branches spreading at maturity

6a. *S. lepida* var. *lepida*

1. Leaf blades involute, filiform, less than 1.5 mm broad; inflorescence mostly 4–8 cm long, contracted, the branches short, erect

6b. *S. lepida* var. *andersonii*

6a. *Stipa lepida* Hitchc. var. *lepida*. *S. eminens* of California auth., not Cav.

From northern California through the coast ranges to Baja California, on rocky, brushy slopes or occasionally in open pine forest. BAJA CALIFORNIA NORTE: Fairly common in the NW below 600 m; to 1300 m in Sierra Juárez; Cerro San Juan de Dios, 700 m; Islas Guadalupe (450 m) and Cedros (300–1050 m). BAJA CALIFORNIA SUR: N slope of Cerro Azul, 550 m; above Encinos, Sierra de la Giganta.

6b. *Stipa lepida* var. *andersonii* (Vasey) Hitchc., Amer. J. Bot. 2:303. 1915.

BAJA CALIFORNIA NORTE: Locally common in semishade 2.5 km S of Johnson Ranch, N of Cabo Colonet, 25 m (Moran 27569).

7. *Stipa pulchra* Hitchc., Amer. J. Bot. 2:301. 1915. Fig. 9. *Culms* 60–100 cm tall, usually puberulent below nodes. *Blades* long, 2–6 mm broad, green, flat or sometimes involute. *Glumes* 3–5-nerved, the first 15–25 mm long, the second slightly shorter. *Lemmas* 7.5–12 mm long, stout, sparingly pilose, sometimes with smooth neck and ciliate fringe at apex; awns 6–9 cm long, twice-geniculate, pubescent on lower section, with stiff, straight terminal section. *Paleas* membranous, 1–2 mm long.

Northern California to Baja California on dry brushy or forested slopes, below 1500 m in the southern part of the range. BAJA CALIFORNIA NORTE: Mostly near coast, to S of Ensenada; Islas los Coronados (S island).

8. *Stipa cernua* Stebbins & Love, Madroño 6:137. 1941. *S. pulchra* var. *cernua* Beetle & Tofsrud. Similar to *S. pulchra* but blades 1.2–2.4 mm broad, glaucous and usually involute at tips. *Lemmas* slender, cylindric, often less than 7.5 mm long. *Awns* with fine flexuous terminal segment.

California and northern Baja California, on dry slopes to 1500 m. BAJA CALIFORNIA NORTE: Near coast S to El Rosario; Sierra Juárez to 1300 m (Ru-



Fig. 8. *Melica frutescens*: plant; a, glumes; b, spikelet without glumes. From U.S.D.A. Bull. No. 17.



Fig. 9. *Stipa pulchra*: panicle, lemma. From Hitchcock, 1935.

morosa; Portezuelo de Jamaú); foothills of Sierra San Pedro Mártir to 700 m.

7. *Oryzopsis* Michx.

1. *Oryzopsis hymenoides* (R. & S.) Ricker in Piper, Contr. U.S. Natl. Herb. 11:109. 1906. INDIAN RICE-GRASS. Fig. 10. Strong perennial with tufted culms mostly 30–70 cm tall. *Leaves* mostly in basal clumps, the blades long, firm, filiform, tightly involute, not over 2 mm broad. *Panicles* open, diffuse, dichotomously branched, with spreading branchlets and 1-flowered spikelets on long slender pedicels. *Spikelets* 5–8 mm long excluding awn, disarticulating above glumes. *Glumes* subequal, broad, thin, glabrous to puberulent, 3-nerved, acuminate at tip, 5–8 mm long. *Lemmas* firm or hard, dark brown to nearly black at maturity, 3–4 mm

long, pubescent with hairs mostly 2–4 mm long. Awn straight, 3–6 mm long, readily deciduous.

Throughout the mountains of western USA and to northern Mexico, on dry sandy usually open slopes, at a wide range of elevations. BAJA CALIFORNIA NORTE: E side of Sierra Juárez: 3 km N of La Rumorosa, 1150 m, *Moran* 29755; "Cantillas Mountains" [vicinity of Cañón Tajo], *Orcutt* 1147 (cited by Hitchcock, 1913:285). Sandy bed of Arroyo Alfredo NW of ex-misión Santa María, 700 m, *Moran* 12188. According to Wiggins (1980:892), it extends upward into pine forest in the Sierras Juárez and San Pedro Mártir.

8. *Piptochaetium* Presl

1. *Piptochaetium fimbriatum* (H.B.K.) Hitchc., J. Wash. Acad. Sci. 23:453. 1933. FALSO ESPARTILLO



Fig. 10. *Oryzopsis hymenoides*: plant, glumes, floret. From Gould, 1951.

DEL PINAR, PINYON RICEGRASS. Fig. 11. Tufted perennial with leaves mostly in basal clump and slender erect culms 30–80 cm tall. *Leaves* glabrous, the basal blades filiform, involute, mostly 1 mm or less broad and 5–30 cm or more long. *Panicles* few-flowered, open or loosely contracted, the slender branches bare of spikelets on lower $\frac{1}{2}$ – $\frac{2}{3}$. Disarticulation above glumes. *Glumes* subequal, thin, broad, acuminate, faintly 3–several-nerved, mostly 5–6 mm long, with hyaline margins and apex. *Lemmas* thick and firm, pubescent, oblong, 4–5 mm long, light colored and with silvery hairs when immature but dark brown and with reddish hairs at maturity. *Lemma* awn stout, 12–18 mm long, weakly twice-geniculate, the lower segment twisted and scabrous. *Palea* mostly enclosed by lemma but tip minutely protruding at lemma apex.

Colorado to Texas, Arizona, and northern Mexico, on rocky slopes at medium and high elevations, often in open woodlands. BAJA CALIFORNIA SUR: Shady N slope, Cerro la Laguna, Sierra San Francisco, 1520 m (Moran 23868); Sierra de la Laguna (Jones 27635; Carter et al. 2396).



Fig. 11. *Piptochaetium fimbriatum*: plant, glumes, floret, palea. From Hitchcock, 1935.

Tribe 6. Poeae

9. *Bromus* L.

Annuals and perennials, the Baja California species without rhizomes or well-developed stolons. *Leaves* with rounded sheaths, these united by margins to well above middle. *Ligule* membranous. *Blades* thin and flat, often broad. *Inflorescence* a panicle, infrequently reduced to a raceme. *Spikelets* 13–45 mm or more long, with 4 to numerous florets, disarticulating above glumes and between florets. *Glumes* unequal, acute, awnless. *Lemmas* 5–13-nerved, 1-awned from notch of bifid apex or infrequently awnless. *Paleas* large, adnate to caryopsis. *Caryopsis* with tuft of hair at apex.

This treatment is based primarily on the revision of *Bromus* in Mexico and Central America by Sod-

erstrom and Beaman (1968) and on the treatment in *Grasses of Southwestern United States* by Gould (1951).

1. Lemma awn strongly twisted below; plants annual ----- 1. *B. trinii*
1. Lemma awn straight when present; annuals and perennials.
 2. Spikelets laterally compressed, the lemmas definitely keeled.
 3. Second glume 5–7-nerved; lemmas 7-nerved, with awn 5–11 mm long ----- 2. *B. carinatus*
 3. Second glume 9–11-nerved; lemmas 9–13-nerved, awnless or with awn less than 3 mm long ----- 3. *B. unioides*
 2. Spikelets not laterally compressed, the lemmas not or only slightly keeled.
 4. Plants perennial; lemmas not or inconspicuously toothed apically; native species of woodland and meadow habitats.
 5. Lemmas densely villous with long hairs between lateral nerves and margins, glabrous or scabrous on back ----- 4. *B. ciliatus*
 5. Lemmas sparsely to densely villous over the back.
 6. Blades 2–4 mm broad; first glume 1- or 3-nerved.
 7. First glume 1-nerved; culm nodes villous ----- 5. *B. anomalus*
 7. First glume 3-nerved; culm nodes glabrous ----- 7. *B. porteri*
 6. Blades, at least some, 5–10 (–14) mm broad; first glume 3-nerved ----- 6. *B. pseudolaevis*
 4. Plants annual; lemmas bifid and toothed apically; adventive weedy species.
 8. Awn of lemma usually 3–6 cm long; second glume 2–3.5 cm long ----- 8. *B. diandrus*
 8. Awn of lemma 2.5 cm or less long; second glume 1.5 cm or less long.
 9. Panicle branches slender, flexuous and drooping, often more than 2 cm long; branchlets and pedicels capillary, curved and usually recurved ----- 9. *B. tectorum*
 9. Panicle branches and pedicels short, stout, erect or stiffly erect-spreading, mostly much less than 2 cm long.
 10. First glume 3–5-nerved; lemma apex broad, rounded or acute, the teeth 1–1.5 mm long ----- 10. *B. mollis*
 10. First glume 1–3-nerved; lemma apex narrow, tapering to narrow acuminate teeth more than 1.5 mm long.
 11. Culms puberulent below panicle; panicles densely flowered, with stiffly erect spikelets ----- 11. *B. rubens*
 11. Culms glabrous below panicle; panicles with few erect or spreading spikelets ----- 12. *B. madritensis*

1. *Bromus trinii* Desv. in Gay, Fl. Chil. 6:441. 1853. *Trisetum barbatum* var. *major* Vasey. CHILEAN BROME, CHILEAN CHES. Slender weak-stemmed annual, with culms mostly 25–70 cm tall. *Sheaths* pilose. *Ligule* an erose membrane 1.8–3.5 mm long. *Blades* flat, 2–8 mm broad, glabrous to sparsely pilose. *Panicles* open or somewhat contracted, mostly 10–25 cm long. *Spikelets* 2–4 cm long ex-

cluding awns, with 3–10 florets. *First glume* long-attenuate, 1-nerved, 6–12 mm long. *Second glume* broader and longer than first, with 3 strong nerves and sometimes 2 weaker lateral nerves. *Lemmas* mostly 8–11 mm long, 7-nerved, finely pubescent, with slender twisted geniculate awn 1–2 cm long from between slender aristate teeth 3–6 mm long.

On dry open or wooded slopes, SW USA to Baja California and in Chile, sometimes considered as introduced in North America. BAJA CALIFORNIA NORTE: Apparently not common; scattered in the NW, to 1000 m in Sierra San Pedro Mártir; Cerro San Juan de Dios, 1100 m; Sierra San Luis, 1300 m; Sierra San Borja, 250–1200 m; Islas San Martín, Guadalupe, and Cedros.

2. *Bromus carinatus* Hook. & Arn., Bot. Beechey Voy. 403. 1840. Annual or weak perennial. *Culms* mostly 40–80 cm tall but occasionally as much as 120 cm tall. *Blades* thin, long, flat, 2–6 mm broad, glabrous or rarely with few hairs. *Panicles* open or loosely contracted, mostly 20–35 cm long, the spikelets erect or drooping on slender pedicels. *Spikelets* laterally compressed, 1.5–3.5 cm long, with 4–10 florets. *First glume* 3-nerved (rarely 4–5-nerved), the second longer, with 7 (rarely 5) nerves. *Lemmas* laterally compressed and sharply keeled, 8–13 mm long, 7-nerved, glabrous or scabrous on back, often finely villous on margins, with awn 5–11 mm long.

Widespread, in British Columbia, western USA, Mexico, and Central America, in Mexico and southward mostly above 1500 m but in Baja California also low. BAJA CALIFORNIA NORTE: In pine woods and sandy arroyo beds at 1500–2000 m, Sierra Juárez (San Pedro; Laguna Hanson) and Sierra San Pedro Mártir (La Sanja; La Vibora; La Joya); in the NW near coast on rocky slopes, in sandy arroyo beds, and on coastal dunes (Jatay; Ensenada; Colonia Guerrero; San Quintín); S in desert (El Progreso, 490 m; Santa Catarina; Arroyo Cataviñá near mouth; S of Punta Prieta); Islas Coronados (N island) and San Martín. BAJA CALIFORNIA SUR: Cañón San Julio, Sierra San Francisco (*Brandege* 17).

Comparing *B. arizonicus* (Shear) Stebbins, chiefly as that occurs in Arizona, with *B. carinatus*, Stebbins and Tobgy (1944) stated that the two have different chromosome numbers, clearly including some non-homologous chromosomes, and form highly sterile hybrids; that *B. arizonicus* occurs at lower elevations; and that *B. arizonicus* differs in being strictly annual and in having glumes relatively

long, lemmas hirsute near the margins, and at least upper lemmas with rather prominent lobes. Without of course having cytological information, they referred two Baja California collections to *B. arizonicus*: San Quintín, *Epling & Stewart in 1936*; E of El Rosario, *Wiggins 5291*. However, Soderstrom and Beaman (1968) referred these two to *B. carinatus*, saying that, at least in Baja California populations, morphological characters give no ready means for separating *B. arizonicus*. Among a dozen Baja California specimens of this complex at SD, Dr. Stebbins in 1980 found none of *B. arizonicus*. Lowland and southern specimens he annotated as "*B. carinatus* H. & A., near *B. marginatus* Nees". Pending further evidence, we follow Soderstrom and Beaman.

3. *Bromus unioloides* H.B.K., Nov. Gen. Sp. 1:151. 1815. RESCUE GRASS. Tufted annual with culms mostly 30–80 cm tall. Culms spreading-erect, relatively thick and weak, succulent when young. Sheaths nearly glabrous to densely puberulent with fine spreading hairs. Blades flat, mostly 5–12 mm broad, glabrous or hirsute. Inflorescence an open or loosely contracted panicle (occasionally reduced to raceme) of large awnless or nearly awnless 5–12-flowered spikelets. Glumes awnless, the first 5–7-nerved, the second usually 9–11-nerved. Lemmas compressed-keeled, glabrous, scabrous or short-pubescent between the nerves, mostly 10–11.5 mm long, awnless or with awn less than 3 mm long.

Widespread in southern North America, mainly as a weed of fields and pastures, ditches, and roadsides, introduced in USA from South America as a forage plant and occasional in Mexico. BAJA CALIFORNIA NORTE: Apparently uncommon, known to us only from three collections in the NW, at 30 m or below (La Mesa, SE of Tijuana; Cantamar; Mañadero).

Although Beetle (1972) argued for the recognition of *B. willdenowii* Kunth as well as *B. unioloides* in Mexico, we are unable to separate the specimens consistently into two taxa.

4. *Bromus ciliatus* L., Sp. Pl. 1:76. 1753. *B. richardsonii* Link. FRINGED BROME. Fig. 12. Perennial, without rhizomes. Culms mostly 0.6–1 m tall, with pubescent nodes. Sheaths rounded, the lower retrorsely pubescent. Blades flat, 5–10 mm broad, glabrous to scabrous. Panicles open, to 20 cm long, with spikelets 2.5–3 cm long on slender drooping branches to 10 cm long and pedicels to 2 cm long. Spikelets to 8-flowered. Lower glume linear-lanceolate, 1-nerved; upper glume obovate-linear, abruptly



Fig. 12. *Bromus ciliatus*: plant, spikelet, floret. From Hitchcock, 1935.

ly narrowed to short-awned tip, 3-nerved, glabrous. Lemmas 10–11 mm long, abruptly narrowed to awn 3–3.5 mm long, 7-nerved, glabrous dorsally and villous on margins and on and between the lateral nerves.

Northern and western North America, southward in pine forests and high meadows, to Mexico only in Baja California. BAJA CALIFORNIA NORTE: Fairly common on forested rocky slopes, Sierra San Pedro Mártir, 1900–2800 m (Cerro Venado Blanco, Cerro de la Cupula, Yerba Buena, Corral de Sam, Los Llanitos, La Encantada, La Víbora). According to Wiggins (1980:911), it occurs also in the Sierra Juárez.

5. *Bromus anomalus* Rupr. ex E. Fourn., Mex. Pl. 2:126. 1886. NODDING BROME. Tufted perennial or long-lived annual. Culms 40–60 (–75) cm tall, decumbent at base, with villous nodes. Sheaths re-

trorsely villous. *Blades* flat, 2–4 mm broad, scaberulous on both surfaces, long-attenuate. *Panicles* to 20 cm long, with slender drooping branches to 7 cm long mostly in whorls of 3 along villous axis. *Spikelets* 2.2–2.7 cm long, with 7–12 or more florets. *Glumes* glabrous or villous, awnless, the first 1-nerved, the second 3-nerved. *Lemmas* ca. 11 mm long, 7-nerved, uniformly villous across back, obtuse at apex, with awn 1–4 mm long. *Palea* slightly shorter than lemma, puberulent between nerves.

Southern Canada to southern Mexico, in pine and oak woodlands and occasionally in scrub forest or grasslands. BAJA CALIFORNIA SUR: La Laguna, ca. 1700 m (Carter et al. 2341, 2395; Jones 27648); La Chuparosa (Brandege 73).

6. *Bromus pseudolaevipes* Wagon, Leaf. West. Bot. 6:64. 1950. Perennial with stout culms to over 1 m tall. *Culm* nodes pubescent or puberulent. *Sheaths* and *blades* essentially glabrous or occasionally pilose, the blades long and broad, to 14 mm broad in the Baja California specimen cited. *Panicles* 10–20 cm long, open, the branches pilose, ascending or drooping. *Spikelets* 1.5–2.5 cm long, 4–10-flowered. *Glumes* pubescent, the first 3-nerved, the second 5-nerved. *Lemma* rounded and pubescent on back, with awns 3–5 mm long.

California coast ranges to northern Baja California, on dry often shady slopes below 1000 m. BAJA CALIFORNIA NORTE: Near and E of Rosarito (Beetle M-2696).

The Beetle collection is atypical in having blades to 14 mm broad. The only other native perennial species of *Bromus* with rounded uniformly hairy lemmas are *B. anomalus*, which typically has the first glume 1-nerved and blades less than 5 mm broad, and *B. porteri*, with glabrous culm nodes and with blades 2–4 mm broad.

7. *Bromus porteri* (J. M. Coulter) Nash, Bull. Torrey Bot. Club 22:512. 1895. Perennial with slender culms mostly 65–85 cm tall. *Culm* nodes typically glabrous. *Sheaths* glabrous or slightly hairy. *Ligule* a brown membrane 0.5–0.6 mm long. *Upper blades* flat or folded, 17–25 cm long, 2–4 mm broad, glabrous on lower surface, glabrous to villous on upper surface. *Panicle* 16–26 cm long, nodding, with slender drooping branches 5–10 cm long. *Spikelets* 2–3 cm long, with 4–9 florets, the glumes and lemmas rounded on back. *First glume* 3-nerved, green and firm below, the upper margins hyaline, glabrous or puberulent on nerves and margins, awnless; second glume slightly longer, 3-nerved, glabrous or puberulent on nerves and margins, usually awned-tipped,

the awn ca. 0.3 mm long. *Lemma* ca. 10 mm long, (5–) 7–9-nerved, with bifid or acute apex, sparsely pubescent on back and often villous on lateral internerves, with awn 3–4 mm long. *Anthems* 3.2–3.4 mm long, brownish-orange.

Widespread in the Rocky Mountain region of USA; rather frequent in the mountains of Mexico, to Chiapas, mostly at 1600–2400 m, often in pine, oak, and juniper scrub. Known in Baja California only from one collection. BAJA CALIFORNIA SUR: Scarce on N ridge, Cerro Azufre, 1600 m (Moran 18751).

This species is similar to *B. anomalus*, from which it differs primarily in the key characters.

8. *Bromus diandrus* Roth, Bot. Abh. 44. 1787. RIP-GUT BROME. Tufted short-lived annual with thick, weak culms mostly 20–70 cm tall. *Sheaths* and blades usually pubescent with spreading hairs. *Blades* soft, flat, mostly 3–7 mm broad. *Panicles* narrow, with stout usually erect branches and pedicels. *Spikelets* mostly 3–4 cm long excluding awns, 5–7-flowered. *Glumes* unequal, lanceolate-acuminate, with broad membranous margins, the first 1-nerved, the second 3-nerved. *Lemmas* glabrous or scabrous, the body 2 cm or more long, with broad hyaline margins and apical teeth usually 4–5 mm long. *Lemma* awn stout, scabrous, 3–6 cm long.

A European species now occasional to frequent as a weed of open disturbed sites in SW USA and Baja California, with a few records from Guatemala. BAJA CALIFORNIA NORTE: Occasional weed of fields and roadsides in the NW, less commonly naturalized in undisturbed areas, from coast to Sierra Juárez (Laguna Hanson, 1610 m) and Sierra San Pedro Mártir (La Encantada, 2200 m); Islas los Coronados and Guadalupe.

In the USA this grass has commonly been referred to another European species, *B. rigidus* Roth.

9. *Bromus tectorum* L., Sp. Pl. 77. 1753. DOWNY BROME. Low to moderately tall annual with weak erect or spreading culms. *Sheaths* and blades usually softly pubescent, occasionally glabrous, the blades flat, 2.5–6 mm broad. *Panicles* loosely contracted, with slender flexuous often S-curved branches. *Spikelets* mostly 1.2–2 cm long excluding awns, usually with 4–6 florets. *Glumes* unequal, thin, with broad hyaline margins, the first glume 1–3-nerved, the second 3-nerved, often notched at apex. *Lemmas* mostly 9–12 mm long, glabrous, scabrous, or soft-pubescent, with membranous mar-

gins and apical teeth 2–3 mm long. *Lemma* awns 10–18 mm long.

Adventive from Europe; now frequent through most of USA and in NW Mexico as a weed of open disturbed sites. BAJA CALIFORNIA NORTE: Abundantly naturalized in meadows and pine woods and on open slopes, Sierra Juárez (900–1800 m) and Sierra San Pedro Mártir (1400–2750 m); Rancho Aguajito, E of El Rosario, 350 m.

Two varieties have been recognized in the Sierra San Pedro Mártir: var. *tectorum*, with soft-pubescent lemmas, and var. *glabratus* Spenner, with glabrous or scabrous lemmas.

10. ***Bromus mollis* L.**, Sp. Pl. ed. 2, 1:112. 1762. SOFT BROME. Tufted annual with weak, usually geniculate-spreading culms 5–40 (occasionally to 70) cm tall. *Blades* soft, flat or folded, glabrous or sparsely hirsute, mostly 2–6 mm broad. *Inflorescence* a densely flowered contracted panicle or raceme, commonly 5–10 cm long but in depauperate plants smaller and with very few spikelets. *Spikelets* 1–2.5 cm long, with 5–10 closely imbricated florets. *Glumes and lemmas* broad, thin, pubescent, several-nerved, the lemma with awn mostly 5–9 mm long.

A weed of open sandy or disturbed clay soils, adventive from Europe and now common over much of USA and in NW Mexico. BAJA CALIFORNIA NORTE: Rather common weed of fields and roadsides in the NW, from Tijuana to San Telmo; occasional in Sierra San Pedro Mártir (San Isidoro, 900 m; ex-misión San Pedro Mártir, 1475 m); Islas los Coronados, Todos Santos, and Guadalupe.

We include in *B. mollis* Baja California collections that have been identified as *B. molliformis* Lloyd.

11. ***Bromus rubens* L.**, Cent. Pl. 1:5. 1755. FOXTAIL BROME. Tufted annual with culms 10–50 cm tall. *Lower sheaths and blades* pubescent, the blades mostly 1.5–3 mm broad but occasionally broader. *Panicles* contracted, dense, mostly 4–8 cm long including awns. *Spikelets* usually dark reddish brown or purple-tinged at maturity. *Glumes* with broad membranous margins, the first 1-nerved, the second 3-nerved. *Body of lemma* ca. 1 cm long, scabrous to pubescent, with broad membranous margins, slender apical teeth 3–5 mm long, and terminal awn 1.5–2.5 cm long. *Paleas* large, ciliate on nerves.

A weedy European annual adventive in North America and now frequent in SW USA; in Mexico apparently known only from Baja California. BAJA CALIFORNIA NORTE: Common weed of disturbed

places in the NW but also widely naturalized even in remote desert areas: from coast to 1900 m in Sierra Juárez and 1600 m in Sierra San Pedro Mártir; Cerro San Juan de Dios; summit of Cerro Matomí, 1600 m; Arroyo Santa Catarina; N of Yubay (29°13'N); Islas los Coronados, Todos Santos, San Martín, Guadalupe, and Cedros.

12. ***Bromus madritensis* L.**, Cent. Pl. 1:5. 1755. A short-lived annual similar to *B. rubens* but usually with glabrous or scabrous leaves (the lower sheaths sometimes puberulent), culms glabrous below inflorescence, panicles tending to be less dense, with fewer spikelets and longer pedicels.

A weedy European grass occasional on open, dry, mostly disturbed sites in SW USA and northern Baja California. BAJA CALIFORNIA NORTE: In the NW (Flor del Sol, 220 m; Descanso, 15 m; Las Delicias, E of Ensenada, 660 m; San Isidoro, Sierra San Pedro Mártir, 900 m).

Wiggins (1980:911, 912) reported four additional species of *Bromus* for which we have seen no specimens. Of these, the annual *B. arenarius* Labill. was given by Munz and Keck (1959:1473) as native to Australia and now “widely scattered” over California. The other three are native North American perennials: *B. marginatus* Nees, of Sect. *Ceratochloa*, and *B. grandis* (Shear) Hitchc. and *B. orcuttianus* Vasey, both of Sect. *Psigma*.

10. ***Brachypodium* Beauv.**

Tufted annuals and perennials with soft flat blades and with spikes or spikelike racemes. *Spikelets* usually few and large (occasionally only 1–2 per inflorescence), usually sessile and erect on unbranched inflorescence axis, with few to several florets. *Glumes* unequal, 3–9-nerved, sharp-pointed, the lemmas firm, rounded or somewhat flattened on back, 7-nerved, awned or mucronate. *Palea* large and firm, as long as lemma, concave. Disarticulation above glumes and between florets.

- 1. Plants perennial; lemma awns 2–9 mm long 1. *B. mexicanum*
- 1. Plants annual; lemma awns mostly 12–20 mm long 2. *B. distachyon*

1. ***Brachypodium mexicanum* (R. & S.) Link.**, Hort. Berol. 1:41. 1833. Perennial with slender culms mostly 25–80 cm tall, freely branched below middle. *Culm nodes* retrorsely hispid-scabrous or bearded with soft hairs. *Ligule* a firm ciliate membrane. *Blades* thin, long and narrow, mostly 2.5–5 mm broad, glabrous or thinly hirsute on both sur-



Fig. 13. *Brachypodium distachyon*: plant, glumes, floret. From Chase, 1951.

faces. *Inflorescence* a short stiffly erect spike, often with as few as 2–3 rather widely spaced spikelets. *Spikelets* solitary at nodes, mostly 2–3.5 cm long. *Glumes* lanceolate, unequal, awnless, the first 3–5-nerved, the second usually 5–7-nerved. *Lemmas* glabrous or scabrous, with straight awn 2–9 mm long.

Open forested areas at medium to high eleva-

tions, Mexico to Colombia. BAJA CALIFORNIA SUR: Cape region: Sierra de la Laguna (*Brandegee in 1890, Carter et al. 2342* at 1650 m); La Chuparosa (*Brandegee 54*).

2. *Brachypodium distachyon* (L.) Beauv. Ess. Agrost. 101, 155. 1812. Fig. 13. Tufted annual with culms mostly 20–60 cm tall. *Culm nodes* puberulent. *Ligule* a firm ciliate membrane. *Blades* short, flat, mostly 2–4 mm broad, glabrous or sparsely hirsute on both surfaces, usually ciliate on lower margins. *Inflorescence* with 1–5 large stiffly erect spikelets, the spikelets mostly 2–3.5 cm long, with 9–18 closely imbricate florets. *Glumes* glabrous, firm, acute or acuminate, the first 3–7-nerved, the second 7–9-nerved. *Lemma* 7-nerved, glabrous or scabrous, 7–10 mm long, tapering to awn usually 12–20 mm long. *Paleas* coarsely pectinate-ciliate with stiff bristle-like hairs, the hairs to 0.5 mm or more long.

A European grass now well established as a weed of roadsides, fields and field borders, and other disturbed sites in California and Texas. BAJA CALIFORNIA NORTE: Abundant in old field as if planted, Ejido Mesa Redonda, 500 m (*Moran 24176*).

11. *Vulpia* C. C. Gmelin

Short-lived annuals with weak decumbent or erect culms branching mainly at base. *Ligules* membranous, usually less than 1 mm long. *Blades* elongate, thin, flat or loosely involute. *Inflorescence* a narrow panicle (rarely reduced to a raceme) with stiff appressed or spreading branches. *Spikelets* with usually 3–17 florets, the uppermost reduced. *Disarticulation* above glumes and between florets. *Glumes* subulate, the first 1-nerved, the second 3-nerved. *Lemmas* lanceolate, acute or acuminate, 5-nerved, mucronate or with awn to 2 cm or more long. *Stamens* 1 or occasionally 3.

The following key is based on the treatment of the North American species by Lonard and Gould (1974).

1. First glume less than $\frac{1}{2}$ the length of second glume 4. *V. myuros*
1. First glume more than $\frac{1}{2}$ the length of second glume.
 2. Spikelets mostly with 5–11 florets, the florets closely imbricated, with rachilla internodes typically 0.5–0.7 mm long; lemma awns 0.3–6 (–9) mm long 1. *V. octoflora*
 2. Spikelets with 1–5 (–7) florets, the florets not closely imbricated, the rachilla internodes usually 1 mm or more long; lemma awns 4–22 mm long.
 3. Panicle branches and pedicels, at least the basal one, spreading or reflexed at maturity and with callus in branch axil 2. *V. microstachys*
 3. Panicle branches and pedicels appressed-erect or

branches spreading at tips from erect base;
branches and pedicels without axillary calluses

----- 3. *V. bromoides*

1. ***Vulpia octoflora*** (Walt.) Rydb., Bull. Torrey Bot. Club 36:528. 1909. COMMON SIXWEEKS GRASS. Culms 10–60 cm tall, solitary or loosely tufted. Culms and leaves glabrous or pubescent. Ligule 1 mm or less long. Blades elongate, 0.5–1 mm broad, soon withering and turning brown. Panicles 2–20 cm long, with erect-appressed branches. Spikelets mostly with 5–11 florets, 4–10 mm long excluding awns. Lemma of lowermost floret 2.6–6.5 mm long, excluding awn.

1. Spikelets, excluding awns, mostly 5.5–10 mm long; awn of lowermost floret 2.5–6 (–9) mm long.
2. Lemma glabrous or slightly scabrous on back, often scabrous on margins ----- 1a. *V. octoflora* var. *octoflora*
2. Lemma prominently long-scabrous to densely pubescent on back, at least near apex ----- 1c. *V. octoflora* var. *hirtella*
1. Spikelets, excluding awns, mostly 4–5.5 mm long; awn of lowermost floret 0.3–3 mm long ----- 1b. *V. octoflora* var. *glauca*

1a. ***Vulpia octoflora*** (Walt.) Rydb. var. *octoflora*. *Festuca octoflora* Walt. Fig. 14.

Widespread throughout North America and introduced elsewhere, mainly at low elevations, in loose sandy soils; frequent in disturbed areas. BAJA CALIFORNIA NORTE: Fairly common in the NW, from coast to at least 1650 m in Sierra Juárez and to 2300 m in Sierra San Pedro Mártir; less common southward in desert, to Arroyo Santa Catarina; Islas Todos Santos, San Martín, and Cedros. BAJA CALIFORNIA SUR: In mountains (Volcán las Tres Virgenes; Sierra de la Laguna; La Chuparosa).

1b. ***Vulpia octoflora*** var. *glauca* (Nutt.) Fern., Rhodora 47:107. 1945.

Widespread in North America but not common in Mexico, in the same sorts of habitat as the typical variety. BAJA CALIFORNIA NORTE: Meadows in Sierra San Pedro Mártir, 2200–2500 m (Vallecitos: La Encantada); Cerro la Chona, Sierra San Borja, 1450 m.

1c. ***Vulpia octoflora*** var. *hirtella* (Piper) Henr., Blumea 2:320. 1937.

British Columbia to Texas and Baja California, in sandy disturbed sites at low to rather high elevations, the commonest variety in SW USA. BAJA CALIFORNIA NORTE: Less common than var. *octoflora* in the NW, sometimes with it in mixed populations; more common southward in desert (Cerro Matomí, 1150 m; Sierra San Luis, 1200 m; Sierra San Borja, to 550 m; Las Lagunitas, 650 m); Islas



Fig. 14. *Vulpia octoflora* var. *octoflora*: plant, spikelet. From Gould and Box, 1965.

San Martín, Guadalupe, Cedros, and Ángel de la Guarda. BAJA CALIFORNIA SUR: Picachos de Santa Clara; Vizcaino peninsula.

2. ***Vulpia microstachys*** (Nutt.) Benth., Pl. Hartw. 342. 1857. Culms solitary or loosely tufted, glabrous or puberulent. Sheaths and blades glabrous or pubescent, blades usually inrolled, mostly 10 cm or less long and 0.5–1 mm broad. Ligules 0.5–1 mm long. Panicles narrow, 3–15 cm long; branches and pedicels at first erect-appressed, in age at least lowermost typically spreading or reflexed. Spikelets 4–9 mm long excluding awns, often purple-tinged, with 1–6 florets, the uppermost reduced. Glumes



Fig. 15. *Festuca ovina*: panicle, floret. From Hitchcock, 1935.

ermost mostly 6–7 mm long excluding awn; awn scabrous, 2–4 mm long. *Paleas* as long as lemmas, scabrous on nerves.

A widespread and variable species, in North America from the Arctic to the northern USA and in higher mountains to northern Mexico; also in Eurasia. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 2750–2800 m: Cerro Venado Blanco (Moran 15639, 15652); Cerro "2828" (Moran 15409, 15619).

13. *Lolium* L.

Annuals and short-lived perennials, with succulent culms and flat or folded blades. *Ligule* membranous. *Inflorescence* a spike of several-flowered spikelets, these borne solitary and oriented edge-wise at nodes of a continuous rachis. *First glume* absent except on terminal spikelet. *Second glume* usually large, broad, several-nerved, awnless. *Lemmas* 5–9-nerved, rounded on back, awnless or awned from apex. *Palea* large, well-developed.

1. Glumes shorter than spikelet 1. *L. perenne*
 1. Glumes exceeding uppermost floret 2. *L. temulentum*

1. *Lolium perenne* L., Sp. Pl. 83. 1753. *L. multiflorum* Lam. BALICO INGLÉS, PERENNIAL RYEGRASS.



Fig. 16. *Lolium perenne*: plant, spikelet, floret. From Hitchcock, 1935.

Fig. 16. Tufted short-lived perennial. *Culms* thick, succulent, glabrous, erect or decumbent at base, mostly 25–70 cm tall. *Leaves* glabrous or scabrous, dark green. *Sheaths* often with delicate auricles. *Blades* elongate, flat or folded, 2–10 mm broad. *Spikes* usually 8–20 (–30) cm long. *Spikelets* mostly 5–10-flowered. *Glumes* broad, $\frac{1}{3}$ – $\frac{2}{3}$ as long as spikelets, with 3–7 strong nerves. *Lemmas* averaging 4–7 mm long, shorter than glumes, 5-nerved, the nerves obscure except on margins and at apex. *Tip of lemma* awnless or with awns to 8 mm long. *Paleas* about as long as lemmas.

Native to temperate Europe and Asia, widely introduced into North America as a lawn and pasture

grass. BAJA CALIFORNIA NORTE: Occasional weed in the NW (Tijuana; La Mesa; Rosarito; Sierra Blanca, 650 m; Rancho San José, Sierra San Pedro Mártir, 625 m).

Included in *L. perenne* as here interpreted are plants with awned spikelets often referred to *L. multiflorum* L.

2. *Lolium temulentum* L., Sp. Pl. 83. 1753. DARNEL. Annual with thick weak culms mostly 30–70 cm tall. *Leaves* glabrous, typically with short sheath auricles and short lacerate membranous ligule. *Blades* 2–8 mm broad. *Spikes* 10–25 cm long, stiffly erect. *Spikelets* mostly 5–9-flowered. *Glumes* broad, 1.5–2 cm long, 5–13-nerved, acute or rounded at apex. *Lemmas* 4–7 mm long, short-awned, smooth or scabrous.

Native to Europe; adventive and now widespread as a weed of fields, roadsides, and ditches, in USA and occasional in northern Mexico. BAJA CALIFORNIA NORTE: Uncommon or at least seldom collected, in the NW: Weedy roadside 9 km SE of La Misión de San Miguel, 250 m (Moran 28344); disturbed sandy area by stream, El Florido, 140 m (Moran 29563).

14. *Poa* L.

Low to moderately tall annuals and perennials. *Ligule* membranous. *Blades* flat or folded. *Inflorescence* an open or contracted panicle, rarely reduced to a raceme. *Spikelets* ovate to oblong, mostly 3–7-flowered, disarticulating above glumes and between florets. *Glumes* relatively broad, awnless, the first 1(–3)-nerved, the second usually 3-nerved. *Lemma* broad, usually 5-nerved, awnless, keeled or rounded on back and with membranous border.

1. Plants annual.

2. Panicle open, at least the lowermost branches widely spreading; lemma nerves all equally developed 1. *P. annua*
2. Panicle contracted, narrow, the branches erect; lemma nerves not equally developed, the midnerve and marginal nerves much stronger than intermediate nerves 2. *P. bigelovii*

1. Plants perennial.

3. Inflorescence branches widely spreading at maturity; ligules less than 1 mm long 3. *P. orcuttiana*
3. Inflorescence branches tightly or loosely erect, not spreading; ligules 3–7 mm long.
4. Lemmas rather uniformly scabrous, at least below middle 4. *P. scabrella*
4. Lemmas with silky hairs on nerves, at least below middle 5. *P. fendleriana*

1. *Poa annua* L., Sp. Pl. 68. 1753. PASTO AZUL ANNUAL, ANNUAL BLUEGRASS. Tufted annual with weak succulent culms mostly 6–30 cm long. *Leaves* glabrous, bright green. *Blades* flat, mostly 1.5–3 mm

broad and 2–12 cm long. *Panicles* mostly 3–8 cm long, the lower branches tending to be stiffly spreading and bare of spikelets on lower $\frac{1}{3}$ – $\frac{1}{2}$. *Lemmas* 2.5–3.5 mm long, variously pubescent to nearly glabrous, the pubescence commonly on middle and marginal nerves but occasionally on internerves. *Anthems* 0.5–1 mm long.

Introduced from Europe and now common throughout North America as a weed of lawns, ditches, field borders, and pastures. BAJA CALIFORNIA NORTE: Occasional in the NW, mostly along streams and ditches and in meadows, from near coast to 1650 m in Sierra Juárez and 2200 m in Sierra San Pedro Mártir; Isla Guadalupe.

2. *Poa bigelovii* Vasey & Scribn. in Vasey, Grasses U.S. Descr. Cat. 81. 1885. PASTO AZUL PRECOZ, BIGELOW BLUEGRASS. Tufted annual with weak succulent culms 10–40 (–60) cm tall. *Leaves* glabrous, the blades thin, linear, 1–5 mm broad. *Panicles* contracted, often interrupted, 2–15 cm long. *Spikelets* (and plants) typically unisexual, the male and female spikelets similar except for presence of stamens or pistils. *Spikelets* 5–7 mm long, with 3–5 florets. *Lemmas* silvery pubescent on midnerve and marginal nerves, often also pubescent on internerves below. *Anthems* less than 1 mm long.

Utah, Colorado, and Oklahoma, to southern California, Texas, and northern Mexico. BAJA CALIFORNIA NORTE: Occasional on shaded slopes and among boulders at edge of desert: Jacumé, Sierra Juárez, 950 m; Paso de San Matías, 1100 m; El Consuelo, 100 m; Sierra San Borja, 250–1200 m. BAJA CALIFORNIA SUR: Cerro Azufre, 1650 m; Volcán las Tres Virgenes, 1150 m.

3. *Poa orcuttiana* Vasey, W. Amer. Sci. 3:165. 1887. Strong perennial with few to several culms from firm tuft or clump of culm bases and basal leaves. *Culms* slender, unbranched above base, mostly 25–70 cm tall. *Leaves* glabrous, the basal sheaths thin, papery, shiny. *Blades* thick, short, flat or folded, mostly 1–3 mm broad and 2–10 cm long. *Inflorescence* open, 4–12 cm long, with spikelets borne on spreading or often reflexed branches mostly 2.5–7 cm long, the branches mostly bare of spikelets below middle. *Spikelets* 5–6 mm long, with 2–4 florets. *Glumes* broad, slightly unequal to nearly equal in length and slightly shorter than lemmas. *Lemmas* 3–4.5 mm long, more or less uniformly puberulent.

Southern California to northern Baja California, mostly in open woodlands. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 1500–2950 m (Cer-

ro de la Cupula; Vallecitos; El Picacho del Diablo; La Concepción; Alto de Corona).

4. *Poa scabrella* (Thurb.) Benth. ex Vasey, Grasses U.S. 42. 1883. Perennial with culms mostly 35–80 (–100) cm tall. Culms and leaves glabrous or scabrous. Ligules 3–7 mm long. Blades thin, flat or folded, filiform, often elongate, mostly 2 mm or less broad. Panicles loosely or tightly contracted, 5–15 cm long, with 2–6-flowered spikelets 6–10 mm long. Glumes glabrous or slightly scabrous. Lemmas 3–5 mm long, more or less uniformly scabrous or scabrous-pubescent to nearly glabrous.

On cliffs and rocky slopes and in open forest, at low to high elevations, eastern Montana to Colorado, California, and northern Baja California. BAJA CALIFORNIA NORTE: Occasional in the NW, from near sea level to ca. 1500 m in Sierra Juárez and Sierra San Pedro Mártir; Isla Guadalupe.

5. *Poa fendleriana* (Steud.) Vasey, U.S.D.A. Div. Bot. Bull. 13. pl. 74. 1893. Fig. 17. Tufted perennial with culms in small to moderately large clumps. Culms mostly 15–80 cm tall, unbranched above base. Ligules mostly 2–5 mm long. Blades relatively short and stiff, 1–4 mm broad, usually folded or involute but occasionally flat. Panicles contracted, mostly 4–10 cm long, the short erect branches glabrous or slightly scabrous. Spikelets 5–10 cm long, with 3–6 (–8) florets. Glumes thin, broad, subequal, glabrous. Lemmas 4–5 mm long, moderately keeled, silky-pubescent on midnerve and marginal nerves and often rather uniformly pubescent on midnerves below middle.

Mostly in forested regions, often on open rocky cliffs and ridges, throughout western USA and to northern Baja California, Sonora, and Chihuahua. BAJA CALIFORNIA NORTE: Sierra Juárez, 1400–1900 m (La Rumorosa; El Progreso; Laguna Hanson; Cerro Jamaú; Cerro Taraizo); Sierra San Pedro Mártir (Cañón del Diablo, 1700 m).

Most Baja California plants of *P. fendleriana* probably are referable to var. *longiligula* (Scribn. & Will.) Gould, which differs from var. *fendleriana* in having ligules 4–7 mm long and blades more frequently flat.

15. *Lamarckia* Moench

1. *Lamarckia aurea* Moench, Meth. Pl. 201. 1794. GOLDENTOP. Fig. 18. Tufted annual with weak culms mostly 10–40 cm tall. Leaves thin, glabrous, the sheaths soon colorless and flattened, the blades flat or folded, 3–6 (–8) mm broad. Panicle contracted, densely flowered, mostly 4–8 cm long, the spikelets in peduncled fascicles, the terminal spike-



Fig. 17. *Poa fendleriana*: plant, panicle, floret, spikelet with glumes detached. From Gould, 1951.

let of each fascicle functional, the others neuter. Functional spikelet with single perfect floret below and rudimentary floret above on long bristle-like stipe. Lemmas of perfect floret and of rudimentary floret each with delicate awn 5–10 mm long. Neuter spikelets mostly with 3–10 florets, the glumes and lemmas thin and papery, awnless, light-colored, bronze or golden tinged.

Native to southern Europe, now a weed from California to Texas and northern Mexico. BAJA CALIFORNIA NORTE: A rather common weed of grassy slopes and flats below 500 m in the NW, S to San Quintín; Islas los Coronados, Todos Santos, and San Martín.



Fig. 18. *Lamarckia aurea*: plant, fertile spikelet, floret. From Hitchcock, 1935.

16. *Briza* L.

1. *Briza minor* L., Sp. Pl. 70. 1753. Delicate short-lived annual with weak culms mostly 15–50 cm tall. *Ligules* membranous, 5–10 mm long. *Blades* thin, flat, mostly 2–8 mm broad. *Panicles* 3–5 cm long, open, freely branched, the spikelets on long spreading capillary pedicels. *Spikelets* glabrous, 2–6 mm long and ca. as broad, 3–12-flowered; disarticulation above glumes. *Glumes* subequal, broad, thin and papery, rounded on back, 3–9-nerved, spreading at right angles to rachilla. *Lemmas* similar to glumes, broader than long, broadly rounded at apex. *Pa'za* short, rounded, with widely spaced nerves.

Native to Europe; adventive in North America as a casual weed of roadsides, ditches, and other areas of disturbed soil in southern and western USA and northern Mexico. BAJA CALIFORNIA NORTE:

Reported by Wiggins (1980:910) as "rare in fields and along roads in N". We have seen no specimens.

17. *Dactylis* L.

1. *Dactylis glomerata* L., Sp. Pl. 71. 1753. Perennial with densely clumped culms. *Ligules* membranous, 2–5 mm long. *Blades* elongate, flat, 2–8 mm broad. *Inflorescence* a panicle 3–20 cm long, with spikelets short-pedicelled in dense one-sided clusters or glomerules at tip of main axis and on a few rather stout erect or spreading little-branched primary branches. *Lower branches* often 6–10 cm or more long, bare of spikelets on lower half. *Spikelets* mostly 2–5-flowered, disarticulating above glumes. *Glumes* unequal, large, keeled, 1–3-nerved, acute, acuminate, or short-awned. *Lemmas* mostly 5–8 mm long, 5-nerved, acuminate or short-awned at tip, keeled. *Paleas* slightly shorter than lemmas.

Native to the cooler parts of Europe and Asia, now widespread as a pasture grass in North America. BAJA CALIFORNIA: Reported by Wiggins (1980:913) as "uncommon in B.C.". We have seen no specimens.

Tribe 7. Aveneae

18. *Koeleria* Pers.

1. *Koeleria pyramidata* (Lam.) Beauv., Ess. Agrost. 84, 166, 175. 1812. *K. cristata* Pers. *K. macranthera* (Ledeb.) Spreng. JUNEGRASS. Fig. 19. Tufted perennial with culms 25–70 cm tall and leaves mainly in basal clump. *Culms* usually puberulent in vicinity of nodes. *Ligules* membranous, 0.5–1 (–2) mm long. *Blades* elongate, 1–4 mm broad, flat, folded, or involute, glabrous or sparsely hispid. *Panicles* contracted, spikelike, 5–15 cm long, with short erect densely flowered branches, the axis and branches puberulent. *Spikelets* 4–5 mm long, 2–6-flowered, disarticulating above glumes. *Glumes* large, thin, acute, scabrous on midnerve, nearly equal in length, the second obovate and only slightly shorter than lowermost lemma. *Lemmas* faintly 5-nerved, scabrous on midnerve, scaberulous or smooth and shiny on back. *Paleas* hyaline, translucent and shiny, as large as lemmas.

Widespread in the North Temperate Region; throughout USA except in the SE, and to central Mexico, on open or partially shaded slopes at low to rather high elevations. BAJA CALIFORNIA NORTE: Known from rather few places in the NW: Cerro Jesús María, 535 m; Ejido Mesa Redonda, 380 m; Descanso, ca. 10 m; Sierra San Pedro Mártir, ca. 2500 m (Yerba Buena; Vallecitos; Tasajara).



Fig. 19. *Koeleria pyramidata*: plant, spikelet. From Gould, 1951.

19. *Sphenopholis* Scribn.

1. *Sphenopholis obtusata* (Michx.) Scribn., *Rhodora* 8:144. 1906. ZACATE DE CUÑA, PRAIRIE WEDGESCALE. Fig. 20. Tufted annual with weak succulent culms mostly 20–80 cm tall. *Leaves* usually glabrous, infrequently pubescent. *Blades* flat, mostly 2–8 mm broad. *Panicles* contracted and densely flowered, mostly 5–20 cm long. *Spikelets* awnless, 1.5–5 mm long, with 2–3 florets. *Glumes* glabrous or scabrous, the first acute, 1–4 mm long, 1 (rarely 3)-nerved, the second wider and longer, obovate, 3 (5)-nerved. *Lemmas* firm, rounded on back, glabrous or scabrous, faintly 5-nerved.

Widespread in North America, from Canada to northern Mexico, in semiarid regions along grassy streambanks, ditches, and other periodically moist areas. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 1500–1675 m: on shaded rocks by stream SSE of Potrero de los Encinos (Oak Pasture) (*Moran* 17947 $\frac{1}{2}$); scarce in wet meadow, Potrero de los Encinos (*Moran* 17985); in wet sand near stream, Cañón del Diablo (*Chambers* 581).



Fig. 20. *Sphenopholis obtusata*: plant, spikelet. From Gould and Box, 1965.

20. *Trisetum* Pers.

1. *Trisetum interruptum* Buckl. var. *californicum* (Vasey) Louis-Marie, *Rhodora* 30:240. 1929. *T. californicum* Vasey. Bull. U.S.D.A. Div. Bot. 12(1): pl. 46. 1892. Fig. 21. Tufted annual with weak erect or geniculate-spreading culms 10–45 cm tall. *Sheaths* hispid with short spreading hairs. *Ligule* a rounded lacerate membrane 1–2 mm long. *Blades* thin, flat, 1–4 mm broad, mostly 2–10 cm long. *Panicle* contracted, mostly 4–12 cm long and 4–15 mm thick. *Spikelets* 4–6 mm long excluding awns, 2–3-flowered. Disarticulation both below glumes and between florets. *Glumes* glabrous or scabrous, about equal in length, the first 3-nerved, the second broader and 3–5-nerved. *Lemmas* glabrous, rounded on back, minutely rugose, obscurely nerved, 3.5–5 mm long excluding awn, with setaceous apical teeth and loosely twisted and twice-geniculate awn mostly 5–8 mm long. *Paleas* hyaline, colorless, usually $\frac{2}{3}$ as long as lemmas.



Fig. 21. *Trisetum interruptum* var. *californicum*: plant, spikelet, glumes, floret, palea. From the original publication of Vasey.

Trisetum interruptum is widespread in SW USA, mostly in low grasslands and along washes and sandy bottoms. The var. *californicum* is known only from the two original collections: it might be expected to grow in similar habitats. BAJA CALIFORNIA NORTE: Northern Lower California (Orcutt 1431); San Ramón [W of Villa Guerrero] (Orcutt 1437). The type locality was given as "Lower California near the boundary".

21. *Avena* L.

Annuals and perennials (Baja California species annual), with thick weak culms, flat succulent blades and large spikelets on long pedicels in a panicle with erect-spreading or drooping branches. *Ligules* membranous. *Spikelets* usually 2–4-flowered, disarticulating above glumes and between florets. *Glumes* thin, long and broad, several-nerved, about equal, longer than lower floret. *Lemmas* firm,

the body often becoming hard, 5–9-nerved, usually notched and with 2 acuminate teeth at apex, on either side of stout, usually twisted and geniculate awn (awn reduced or absent in *A. sativa*).

1. Lemma glabrous; spikelets usually 2-flowered; awn of lemma absent or irregularly developed, rarely geniculate 2. *A. sativa*
1. Lemmas with stiff, usually reddish-brown hairs on dorsal surface; spikelets 2–4-flowered.
 2. Teeth of lemmas acule, not setaceous; spikelets with usually 3–4 florets; pedicels stiff, not capillary 1. *A. fatua*
 2. Teeth of lemmas slender, setaceous; spikelets with usually 2 florets; pedicels capillary, curving 3. *A. barbata*

1. *Avena fatua* L., Sp. Pl. 80. 1753. AVENA SILVESTRE, WILD OAT. Fig. 22. Annual with culms mostly 30–120 cm tall. *Sheaths* glabrous or hispid. *Ligule* 2–4 mm long. *Blades* elongate mostly 5–12 mm broad, glabrous or hispid. *Glumes* 7–9-nerved. *Lowermost lemma* 1.5–2 cm long.

Native to Europe; now frequent through much of North America as a weed of roadsides and other disturbed areas. BAJA CALIFORNIA NORTE: Fairly common in the NW below 500 m, though perhaps less common than *A. barbata*; making its way south along highway into desert (El Pedregoso); Islas Todos Santos, San Martín, and Cedros.

Palmer 94a (MO), collected on Isla Guadalupe in 1875, is tentatively identified with *A. fatua*, though with some characters of *A. barbata*. More recent collections from the island are *A. barbata*.

2. *Avena sativa* L., Sp. Pl. 79. 1753. *A. fatua* var. *sativa* (L.) Hausskn. AVENA, COMMON OAT. Spikelets mostly 2-flowered. *Lemma* glabrous, the awn straight (rarely geniculate), often irregularly developed or absent.

Introduced in North America as a cool-season crop plant, now frequent, but often not persistent, as a weed of roadsides, field borders, and ditches. BAJA CALIFORNIA NORTE: Cultivated but not seen to be adventive: technically outside oatfield fence but not an honest escape, W of San Vicente, 100 m (Moran 28599).

Palmer 94 from Isla Guadalupe seems referable to this species, though the two plants examined (MO) are atypical in having well-developed geniculate awns and long hairs on the rachilla joints. *Palmer 94a*, from the same island is tentatively referred to *A. fatua*.

3. *Avena barbata* Brot., Fl. Lusit. 1:108. 1804. SLENDER OAT. Similar to *A. fatua* but pedicels more slender, spikelets with 2 (occasionally 3) florets,

and lemmas with slender setaceous teeth usually 4 mm or more long.

Native to Europe; now frequent in disturbed sites on the west coast of USA and Mexico. BAJA CALIFORNIA NORTE: Fairly common in the NW below 700 m on grassy slopes and roadsides; Islas los Coronados and Guadalupe.

22. *Aira* L.

1. *Aira caryophyllea* L., Sp. Pl. 66. 1753. HAIR-GRASS. Delicate tufted annual with culms 10–30 cm tall. *Leaves* thin, filiform, mostly basal. *Inflorescence* a delicate open panicle with 2-flowered spikelets borne at and near tips of capillary branchlets and on capillary pedicels. Disarticulation above glumes and between florets. *Spikelets* silvery, shining, about 3 mm long. *Glumes* subequal, 1-nerved or obscurely 3-nerved, membranous. *Lemmas* firm, rounded on back, tapering to 2 slender teeth at apex; lemmas of both florets usually with twisted geniculate awn about 4 mm long attached below middle of back.

Native to Europe, now widely distributed at low to moderately high elevations in North America. BAJA CALIFORNIA NORTE: Wiggins (1980:897) reported this grass "on grassy flats and slopes and along roadsides, NW B.C." We have seen no specimens.

23. *Deschampsia* Beauv.

Annuals and perennials with slender culms and open or contracted panicles of relatively small spikelets. *Ligules* membranous, 4–8 mm long. *Spikelets* 2-flowered, disarticulating above glumes and between florets. *Rachilla* long-hairy. *Glumes* lanceolate, equal or nearly equal, longer than lower floret. *Lemmas* firm, shiny, inconspicuously nerved, rounded on back, 2-toothed at apex, bearing fine dorsal awn below middle.

1. Plants annual, inconspicuously leafy; awns geniculate; panicle typically open, with long slender branches 1. *D. danthonioides*
1. Plants perennial, the culms usually in clumps and conspicuously leafy below; awns straight (rarely slightly geniculate in *D. caespitosa*)
2. Panicles typically open, with long capillary spreading branches; panicles not more than ¼ the length of flowering culm 2. *D. caespitosa*
2. Panicles typically contracted, the branches appressed or only slightly spreading; panicles about ½ the length of flowering culm 3. *D. elongata*

1. *Deschampsia danthonioides* (Trin.) Munro in Benth., Pl. Hartw. 342. 1857. *D. gracilis* Vasey. ANNUAL HAIRGRASS. Fig. 23. Annual with slender



Fig. 22. *Avena fatua*: panicle, spikelet. From Gould, 1975, 1978.

culms 15–60 cm tall, never densely tufted or conspicuously leafy. *Leaf blades* thin, mostly 1.5 mm or less broad. *Panicles* open, 5–12 cm long, with slender branches bearing spikelets near ends. *Glumes* strongly or faintly 3-nerved, 4.5–8 mm long. *Lemmas* glabrous, 2–3 mm long, with geniculate awn 4–7 mm long.

Alaska and Montana to Arizona and Baja California, in moist meadows and in low open areas subject to occasional flooding; also Chile. BAJA CALIFORNIA NORTE: At low elevations in the NW, commonly in or about vernal pools (Tijuana airport; Valle Redondo; Valle las Palmas; SE of La Misión; San Antonio del Mar; Ejido Emiliano Zapata; Ejido Papalote; E of El Rosario); moist meadows in Sierra Juárez to 1700 m (N of Las Juntas; Rancho San Pedro; Los Pantalones).



Fig. 23. *Deschampsia danthonioides*: panicle, glumes, floret. From Hitchcock, 1935.

2. *Deschampsia caespitosa* (L.) Beauv., Ess. Agrost. 91, 149, 160. 1812. TUFTED HAIRGRASS. Perennial with culms in tufts or dense clumps. Culms 50–80 cm tall. Leaves glabrous or scabrous, the blades firm, folded, or flat, 1.5–4 mm broad. Ligules acuminate, 4–7 mm long. Panicle 10–25 cm long, with slender spreading compound branches bare of spikelets below middle. Glumes ovate or ovate-lanceolate, 4.5–6 mm long, glabrous, 1-nerved (the second occasionally 3-nerved), ca. as long as spikelet. Lemmas typically glabrous except for tuft of short hairs on callus, with straight or twisted rarely weakly geniculate awn 2–4 mm long arising from base; lemma of lower floret ca. 3 mm long.

Alaska and Greenland through western and mid-western USA to California, Arizona, and Baja California; also in the Old World; meadows, moist banks, and seeps, southward at medium to high elevations. BAJA CALIFORNIA NORTE: Scarce at edge of wet meadow, La Grulla, Sierra San Pedro Mártir, 2100 m (Moran & Thorne 14492).

3. *Deschampsia elongata* (Hook.) Munro in Benth., Pl. Hartw. 342. 1857. SLENDER HAIRGRASS. Densely tufted perennial with fine and filiform basal leaves. Culms 25–80 cm tall. Blades seldom more than 1.5 mm broad, those of basal tuft often narrower than those above. Panicle narrow, 8–30 cm long, with usually short, erect-appressed or slightly spreading branches, these moderately if at all rebranched. Spikelets similar to those of *D. caespitosa* but lemma awns typically 5–6 mm long and callus hairs mostly 1–1.8 mm long rather than about 1 mm long.

Alaska to Wyoming, New Mexico, California, and Baja California, mostly in mountain meadows and seep areas, southward at moderate to high elevations. BAJA CALIFORNIA NORTE: Occasional in damp sand under willows, Rancho el Potrero, Sierra San Pedro Mártir, 875 m (Moran 16340).

24. *Peyritschia* E. Fourn.

1. *Peyritschia pringlei* (Scribn.) Koch, Taxon 28(1, 2/3):233. 1979. Fig. 24. Slender perennial with leaves well distributed on culm. Culms mostly 40–100 cm tall. Ligules rounded or truncate, the lower ca. 2 mm long, the upper often longer. Blades linear, flat or folded, mostly 1–3 mm broad. Inflorescence a narrow contracted panicle 8–15 (–20) cm long and 4–10 mm broad. Spikelets 2-flowered. Glumes ca. equal, longer than lemmas, scabrous on midnerve, membranous at acuminate tip. Rachilla short-pilose between florets. Lemma of lower floret 3–3.5 mm long, narrow, smooth and rounded,

notched at narrow apex, with slender weakly geniculate and twisted awn attached near base and usually extending 2–3 mm above tip of lemma. *Upper floret* awned, similar to lower but slightly smaller. Anthers 0.6–0.8 mm long.

Rocky exposed slopes and shaded banks at moderately high elevations in western and central Mexico. BAJA CALIFORNIA SUR: Cape region: La Chuparosa (*Brandegge 55*).

25. *Holcus* L.

1. *Holcus lanatus* L., Sp. Pl. 1048. 1753. Perennial with thick weak puberulent culms mostly 25–100 cm tall. *Sheaths* rounded on back, puberulent or pubescent. *Ligule* a lacerate ciliate membrane 1.5–3 mm long, continuous with sheath margins. *Blades* soft, flat, elongate, mostly 5–10 mm broad, typically sparsely hispid or hirsute on both sides. *Inflorescence* irregularly contracted, densely flowered, 4–15 cm long, 1.5–5 cm broad. *Spikelets* 2-flowered, 4–6 mm long, disarticulating below glumes. *Glumes* subequal, ciliate on midnerve and often scabrous-hispid on back, the first 1-nerved, 3–4.5 mm long, the second much broader, 3-nerved. *Lower floret* ca. 2 mm long, perfect, with firm smooth shiny awnless lemma and palea. *Upper floret* usually staminate, ca. as long as lower but more slender, the lemma with short stout hooked yellowish awn from back near apex.

Adventive from Europe and widespread in USA. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:900) on light sandy or gravelly soil in the NW; but we have seen no specimens.

26. *Dissanthelium* Trin.

1. *Dissanthelium californicum* (Nutt.) Benth. in Hook. f., Icon. Pl. 14:56. pl. 1375. 1881. *Stenochloa californica* Nutt. Fig. 25. Low annual with decumbent-spreading culms. *Leaf blades* flat, mostly 2–4 mm broad and 10–15 cm long. *Inflorescence* a narrow but loose panicle 10–15 cm long, the panicle branches short and more or less fascicled. *Spikelets* awnless, mostly 2-flowered. *Glumes* thin, acuminate, nearly equal, 3–4 mm long, the first 1-nerved, the second 3-nerved. *Lemmas* laterally compressed, pubescent, 3-nerved, about 2 mm long.

Endemic to Santa Catalina and San Clemente Islands, California, and Isla Guadalupe, Baja California: collected only once on each island and very likely now extinct. BAJA CALIFORNIA NORTE: Isla Guadalupe "on warm rocky slopes in the middle of the island; not very abundant; very succulent, and



Fig. 24. *Peyrisschia pringlei*: panicle, spikelet, florets. From Pohl, 1980.

the goats are very fond of it" (Dr. Edward Palmer, quoted by Watson, 1876:120).

27. *Calamagrostis* Adans.

1. *Calamagrostis densa* Vasey, Bot. Gaz. 16:147. 1891. Rhizomatous perennial with tufted stout culms ca. 1 m tall. *Sheaths* glabrous or scabrous. *Ligules* 3–5 mm long. *Blades* flat or subinvolute, scabrous, 15–25 cm long, 3–8 mm wide. *Inflorescence* a spicate panicle 10–15 cm long. *Spikelets* 1-flowered; rachilla disarticulating above glumes, extending as bristle behind palea. *Glumes* ca. equal, 4.5–5 mm long, acute, awnless, scaberulous. *Lemma* 3.5–4 mm long, with slender awn from near base, often exerted sideways.

Previously known only from dry slopes at 100–1400 m in Orange and San Diego Cos., California. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:888) from "foothills and mountains of N B.C.". We have seen no specimens.

28. *Agrostis* L.

Annuals and perennials, several with rhizomes. *Ligules* membranous, often long. *Blades* flat or involute. *Inflorescence* an open or contracted pani-



Fig. 25. *Dissanthelium californicum*: plant, spikelet. From Hitchcock, 1935.

cle. *Spikelets* small, one-flowered, disarticulating above glumes (except in *A. semiverticillata*). *Glumes* thin, lanceolate, acute to acuminate, nearly equal, usually much longer than floret. *Lemmas* thin, 3- or 5-nerved, awnless or awned from middle or below. *Paleas* present or absent.

1. *Paleas* present, 1 mm or more long; plants usually rhizomatous or stoloniferous.
 2. Panicle branches in dense verticils, the panicle contracted and densely flowered; glumes 2 mm or less long; plants usually with creeping stolons ----- 1. *A. semiverticillata*
 2. Panicle branches not in dense verticils, the panicle contracted but usually not densely flowered; glumes, at least some, more than 2 mm long; plants usually with both stolons and rhizomes ----- 2. *A. stolonifera* var. *palustris*
1. *Paleas* absent or 0.5 mm or less long.
 3. Plants annual; lemma awn usually 3.5–6 mm long, conspicuously exserted; about vernal pools ----- 3. *A. microphylla*
 3. Plants perennial; lemma awn mostly less than 3 mm long, inconspicuous, or awn lacking.
 4. Anthers 1.1–1.6 mm long; lemmas mostly awned, the awn from well below middle; rhizomes often present ----- 4. *A. diegoensis*
 4. Anthers 0.3–0.6 mm long; lemmas commonly awnless, or awn from middle or above; rhizomes and stolons absent.
 5. Panicle narrow, rather dense, some branches of each fascicle with spikelets nearly to base ----- 5. *A. exarata*
 5. Panicle open, often diffuse, the branches capillary, with spikelets only above middle ----- 6. *A. scabra*

1. *Agrostis semiverticillata* (Forssk.) Christ., Dansk. Bot. Arkiv. 4:12. 1922. *A. verticillata* Vill. *Polypogon semiverticillata* (Forssk.) Hylander. CASTILLITOS DE AGUA, WATER BENTGRASS. Tufted perennial with thick succulent culms usually decumbent or stoloniferous below. Erect part of culms mostly 10–50 (–70) cm long. *Ligules* 2–7 mm long. *Blades* thin, 2–8 mm broad, usually less than 12 cm long but occasionally longer. *Panicles* densely flowered, contracted and lobed, 4–12 cm long, 1–3 cm thick. *Panicle branches* short, spikelet-bearing to base. *Spikelets* 1.3–2 (–2.5) mm long. *Lemmas* 0.9–1.5 mm long, thin, hyaline and shiny, awnless. *Anthers* 0.4–0.7 mm long.

Adventive from the Old World; now occasional through much of western North America, in moist soil of streambanks, ditches, and swales. BAJA CALIFORNIA NORTE: Fairly common in the NW, from coast to Sierra Juárez and to 2200 m in Sierra San Pedro Mártir; Isla Cedros, 10–600 m.

This is the only species of *Agrostis* in which the spikelet disarticulates below the glumes. It has often been placed in *Polypogon*, as *P. semiverticillata* (Forssk.) Hylander.

2. *Agrostis stolonifera* L. var. *palustris* (Huds.) Farw., Rep. Mich. Acad. Sci. 21:351. 1920. CREEPING BENTGRASS. Mat- or turf-forming perennial with culms typically 8–40 cm tall from decumbent or stoloniferous base. *Ligules* 1–6 mm long. *Blades* flat, 1–5 mm broad, seldom over 10 cm long. *Panicles* contracted, 2–15 cm long, 0.5–2.5 cm broad, open at anthesis and then contracting. *Glumes* 2–3 mm long, 1-nerved, scabrous on nerve near tip. *Lemmas* $\frac{2}{3}$ – $\frac{3}{4}$ as long as glumes, 3–5-nerved, minutely hairy at base. *Paleas* about $\frac{2}{3}$ as long as lemmas. *Anthers* 1–1.5 mm long.

Native to Europe and temperate Asia; now well established in both eastern and western North America, in seeps and moist ditches and meadows. BAJA CALIFORNIA NORTE: Apparently uncommon: Playas de Tijuana, 10 m (Moran 18544); La Grulla, Sierra San Pedro Mártir, 2100 m (Moran & Thorne 14466); Isla Cedros, 10 m (Moran 15159).

3. *Agrostis microphylla* Steud., Syn. Pl. Glum. 1:164. 1854. Tufted annual with slender culms 8–40 cm tall. *Ligules* membranous, fimbriate, to 4 mm or more long. *Blades* 2–3 mm broad, mostly 2–15 cm long. *Panicles* generally 2–8 cm long, contracted and dense. *Glumes* nearly equal, 3–4.5 mm long, acuminate to awn-tipped. *Lemmas* 1.7–1.9 mm long, minutely toothed at apex, with an awn 3.5–6 mm long from about middle or slightly above. *Palea* absent.

In moist open habitats at low to high elevations, Vancouver Island to Baja California. BAJA CALIFORNIA NORTE: Guadalupe Ranch (Orcutt in 1886, cited by Hitchcock, 1913:320); locally common near vernal pool, mesa north of Cabo Colonet, 75 m (Moran 28447, 28643).

4. *Agrostis diegoensis* Vasey, Bull. Torrey Bot. Club 13:55. 1886. Culms mostly 50–100 cm tall, curving-erect, mostly in small clumps, commonly from rhizomes. *Ligules* 2–3 mm long. *Blades* usually 2–6 mm broad, the lowermost flat and lax but secondary leaves sometimes extremely narrow and involute. *Panicles* narrow and contracted, with all branches short and floriferous to base or with some branches bare of spikelets on lower $\frac{1}{2}$ or $\frac{1}{3}$. *Spikelets* 2.5–3 mm long, acuminate. *Lemma* slightly shorter than glumes, awnless or with short awn from below middle.

British Columbia and Montana to California, Nevada, and Baja California, on brushy slopes, in meadows, and along streams, at low to medium elevations. BAJA CALIFORNIA NORTE: Occasional on shady slopes along NW coast: Arroyo Jatay, 40 m



Fig. 26. *Agrostis exarata*: a, leaf sheath, ligule, blade; b, spikelets; c, plant; d, upper culm with panicle; e, floret; f, spikelet. From Mason, 1957.

(Moran 28770); Punta Banda, 350 m (Moran 15921); Arroyo Hediondo, SE of Eréndira, 75 m (Moran 28673); north island, Islas Coronados, 100 m (Moran 8312).

5. *Agrostis exarata* Trin., Gram. Unifl. 207. 1824. SPIKE BENTGRASS. Fig. 26. Perennial with slender to coarse culms 1–10 dm or more tall, in small to large clumps, without rhizomes or stolons. *Ligules* 2–6 mm long. *Blades* long, flat, mostly 2–10 mm wide, usually scabrous. *Panicle* 5–30 cm long, narrow, often lobed, the short branches floriferous nearly to base, with short-pedicelled spikelets. *Glumes* nearly equal, acuminate to awn-tipped, scabrous at least on keel, in ours mostly 1.2–3.0 mm long. *Lemma* in ours 0.9–1.9 mm long, commonly awnless, sometimes short-awned above middle. *Palea* minute or absent. *Anthers* in ours 0.3–0.5 mm long.

Alaska to Nebraska, Texas, and Mexico, mostly in wet places, often in partial shade; southward mostly at middle and high elevations. In Baja California in meadows and arroyo beds. BAJA CALIFORNIA NORTE: Tijuana, *Stokes in 1895*; Sierra Juárez, 1250–1300 m (Agua Hechicera; San Faustino); Sierra San Pedro Mártir, 1600–2550 m (e.g. Cañón del Diablo; Los Llanitos; Rancho San Pedro Mártir; Potrero de los Encinos; La Grulla). BAJA CALIFORNIA SUR: Cape region: La Chuparosa, 1800 m, *Carter & Ferris s.n.*

In the variable *A. exarata* we include plants with slender culms 1–4 dm tall, leaves to 10 cm long but less than 1 mm wide, panicles 3–13 cm long and 2–5 mm thick, and spikelets mostly 1.5–2 mm long. These grow in dry meadows at 2200–2500 m in the Sierra San Pedro Mártir: e.g. W. of Vallecitos, *Moran 15395*; Yerba Buena, *Moran & Thorne 14157*; NW of Los Llanitos, *Moran 28010*. The spikelets are much smaller than described for *A. exarata* to the north: glume length for the species is often put at 2.5–4 mm, following Hitchcock (e.g. 1935a: 335). Collections of *A. exarata* from wetter places in the Sierra (e.g. by small stream, Yerba Buena, *Moran & Thorne 14218*) have culms to 9 dm tall, leaves to 6 mm wide, and spikelets mostly 2–3 mm long. In all Baja California specimens now at hand, as in many from farther north, spikelets measure small, mostly less than 3 mm long.

Although some specimens of the dry-meadow plant have been identified with *A. blasdalei* Hitchc., of the north coast of California, they differ from *A. blasdalei* in their taller and strictly erect culms, longer leaf blades and ligules, longer panicle, smaller and less scabrous spikelets, and usually if not always awnless lemmas. Rather, they seem clearly to be a small form of *A. exarata* and connected by intermediates with larger forms.

6. *Agrostis scabra* Willd., Sp. Pl. 1:370. 1797. ROUGH BENTGRASS. Tufted perennial without rhizomes or stolons. Culms slender, erect, 30–60 (–80) cm tall. Ligules 2–6 mm long. Blades thin, flat, mostly 0.5–3 (–4) mm broad. Panicles loose and open, 7–30 (–40) cm long, with long flexuous branches bearing spikelets only near tips. Spikelets 2–2.8 (–3.2) mm long. Glumes nearly equal, acute or acuminate, scabrous on single nerve. Lemmas awnless, slightly shorter than glumes. Paleas absent. Anthers about 0.6 mm long.

Widespread in North America, from Canada to central Mexico, on moist banks and in moist meadows, southward at intermediate to high elevations.

BAJA CALIFORNIA NORTE: Sierra Juárez (Laguna Hanson); Sierra San Pedro Mártir, mostly 2100–2550 m, rarely to 875 m (Yerba Buena; Vallecitos; Los Llanitos; La Grulla; Rancho el Potrero).

Wiggins (1980:883) reported *Agrostis tandilensis* (Kuntze) Parodi from “beds and margins of vernal pools, vicinity of San Agustín”. This is described as annual, with obvious palea and with pilose deeply bifid lemmas 2.5–3 mm long having awns 5–6 mm long. The distribution is reported as San Diego and Solano Counties, California, Baja California, and Argentina.

29. *Alopecurus* L.

Tufted annuals (ours) and perennials, a few rhizomatous, with flat blades and contracted cylindrical panicles of 1-flowered spikelets. Disarticulation below glumes, the spikelets falling entire. Glumes equal, awnless, usually united on lower margins, ciliate on keel. Lemmas about as long as glumes, firm, 5-nerved, obtuse, awned on back below middle.

1. Spikelet 3–3.5 mm long; panicle dense 1. *A. howellii*
1. Spikelets 4–5 mm long; panicles relatively loose
..... 2. *A. saccatus*

1. *Alopecurus howellii* Vasey, Bull. Torrey Bot. Club 15:12. 1888. *A. californicus* Vasey, Fig. 27. Tufted annual with glabrous culms 15–50 cm tall. Leaves glabrous or scabrous. Ligules membranous, 2 mm or more long, the margins continuous downward with sheath margins. Upper sheaths often inflated and enclosing basal part of inflorescence. Blades soft, flat, 1–3 (–4) mm broad. Panicle tightly contracted, mostly 2–6 cm long and 4–7 mm thick. Glumes abruptly pointed, 3–3.5 mm long, with long hairs on keel and short soft appressed hairs on lateral nerves. Lemmas glabrous, with geniculate awn 3–6 mm long attached near base.

In moist ditches and depressions, Oregon to Baja California. BAJA CALIFORNIA NORTE: Occasional in vernal pools: mesa SE of La Misión, 260 m (*Moran 28408, 29577*); mesa N of Cabo Colonet, 80 m (*Moran 28437, 28443*); San Quintín (*Orcutt 1438*).

2. *Alopecurus saccatus* Vasey, Bot. Gaz. 6:290. 1881. Tufted annual with culms 10–25 cm tall. Panicle 2–4 cm long, less dense. Spikelets 4–5 mm long. Lemmas with awns 5–8 mm long.

Wet places, Washington to California. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:885) from “mud flats and along waterways, vicinity of

San Quintín". We have seen no specimens. However, *A. howellii* appears very close to *A. saccatus*, and possibly it is not distinct.

30. *Polypogon* Desf.

Low to moderately tall annuals and perennials with usually weak geniculate culms that freely branch and root at lower nodes. *Ligules* membranous. *Blades* thin and flat. *Inflorescence* a dense contracted panicle of small spikelets. *Spikelets* one-flowered, disarticulating below glumes. *Glumes* about equal, abruptly awned. *Lemma* much shorter than glumes, awnless or with delicate awn.

1. Awn of glume usually 5–10 mm long, conspicuous; annual with uniformly dense panicles 1. *P. monspeliensis*
1. Awn of glume usually 2–4 mm long, inconspicuous; perennial with typically lobed and interrupted panicles.
 2. Ligules 2–5 mm long, longer than wide; awns stiff and straight 2. *P. interruptus*
 2. Ligules mostly less than 2 mm long and wider than long; awns delicate, flexuous 3. *P. australis*

1. ***Polypogon monspeliensis* (L.) Desf.**, Fl. Atlant. 1:67. 1798. RABBITFOOT GRASS. Fig. 28. Low annual with glabrous or scabrous herbage. *Culms* thick and succulent, mostly 8–70 cm or more long. *Ligules* 4–10 mm long. *Blades* mostly 2–8 mm broad, short or long. *Inflorescence* 2–15 cm or more long, 1–2.5 cm broad, bristly with yellowish awns. *Glumes* thin, scabrous-pubescent, narrow, the body 1.5–2 mm long, usually minutely lobed at apex. *Lemma* and *palea* thin and hyaline; lemma usually with delicate deciduous awn about 1 mm long. *Caryopsis* brownish, minutely rugose, 1 mm or less long.

Native to Europe; adventive in North America and now widespread from Canada to Mexico, growing in moist swales and ditches and along streams, usually in sandy soils. BAJA CALIFORNIA NORTE: Common in the NW, from coast to 1600 m in Sierra Juárez and to 2500 m in Sierra San Pedro Mártir, S to San Quintín; Islas los Coronados, Todos Santos, Guadalupe, and Cedros.

2. ***Polypogon interruptus* H.B.K.**, Nov. Gen. Sp. 1:134. 1816. DITCH POLYPOGON. Similar to *P. monspeliensis* but perennial and usually with more lobed and interrupted panicles, slightly longer glume body (2–3 mm long), and shorter glume awns.

Western North America from British Columbia to Mexico, and in southern South America, in moist sandy soil. BAJA CALIFORNIA NORTE: Occasional along streams in the NW, from coast (S of Rosarito;



Fig. 27. *Alopecurus howellii*; plant, spikelet, floret. From U.S.D.A. Div. Bot. Bull. No. 13.



Fig. 28. *Polypogon monspeliensis*: plant, glumes, floret. From Hitchcock, 1935.

Eréndira) to 1500 m in Sierra San Pedro Mártir (ex-misión San Pedro Mártir). BAJA CALIFORNIA SUR: Río la Purísima.

3. *Polypogon australis* Brongn. in Duperrey, Voy. Monde 2:21. 1829. Perennial with culms mostly 70–100 cm tall. *Ligule* often a narrow fringe, seldom longer than wide or more than 2 mm long. *Blades* mostly 5–7 mm broad. *Panicle* lobed or interrupted, mostly purplish, lax, mostly 8–15 cm long. *Glumes* ca. 3 mm long, the awn flexuous, delicate, 4–6 mm long. *Lemma* ca. $\frac{2}{3}$ as long as glumes, with awn ca. 3 mm long.

Native to Argentina and Chile; introduced in California and Baja California, where it grows in marshy ground or shallow water (Rubtsoff, 1961:166). BAJA CALIFORNIA NORTE: Isla Cedros (Mason 2016).

31. *Phalaris* L.

Annuals and perennials, the annuals with weak succulent culms. *Leaves* generally glabrous, with membranous ligules and flat blades. *Inflorescence* a cylindrical, tightly contracted panicle. *Spikelets* awnless, laterally compressed, with large glumes, single perfect floret, and (except in *P. paradoxa*) one or two scale-like reduced florets below perfect one; disarticulating above glumes. *Lemma* of perfect floret coriaceous and shiny, permanently enclosing faintly 2-nerved palea and plump caryopsis.

1. Spikelets deciduous in groups of 6–7, each group consisting of 1 perfect and 5–6 neuter spikelets; scale-like reduced florets absent; keel of glumes broadly winged, the wing with tooth or deep notch near apex 1. *P. paradoxa*
1. Spikelets not deciduous in groups, every spikelet with perfect floret; scale-like reduced florets present below perfect ones; keel of glumes winged or not, the wing when present only occasionally toothed or notched.
 2. Annuals; panicle ovoid to cylindric, not lobed.
 3. Keel of glumes not winged 5. *P. lemmonii*
 3. Keel of glumes winged.
 4. Reduced florets 2.
 5. Lateral nerves of glumes glabrous or scabrous, with 5 spicules or fewer; panicle usually 2–7 cm long; culms mostly 30–70 cm tall 2. *P. caroliniana*
 5. Lateral nerves of glumes scabrous, with 9 or more spicules; panicle usually 6–15 cm long; culms mostly 60–150 cm tall 3. *P. angustata*
 4. Reduced floret 1; panicle usually 2–6 cm long 4. *P. minor*
 2. Stout rhizomatous perennial; panicle mostly lobed 6. *P. arundinacea*

1. *Phalaris paradoxa* L., Sp. Pl. ed. 2, 2:1665. 1763. HOOD CANARYGRASS. *Culms* 30–100 cm tall, geniculate and spreading below and sometimes rooting at lower nodes. *Ligules* 4–9 mm long. *Blades* 4–10 mm broad. *Panicles* mostly 3–7 cm long, usually remaining partially enclosed by subtending inflated sheath. *Glumes* of perfect spikelets 6–8 mm long, tapering to stiff awn tip, those of sterile spikelets smaller. *Sterile spikelets* near base of panicle tending to be deformed and greatly reduced. *Lemma* of perfect florets ca. 3 mm long, smooth and shiny, with few hairs at apex or entirely glabrous. *Sterile florets* absent or rudimentary.

Native to Europe; established as a weed of disturbed soils at widely scattered places in North and South America. BAJA CALIFORNIA NORTE: Occasional in roadside ditches and vernal pools below 400 m in the NW, S to Colónet.

2. *Phalaris caroliniana* Walt., Fl. Carol. 74. 1788. CAROLINA CANARYGRASS. Fig. 29. Tufted glabrous

annual with culms mostly 20–70 cm tall. *Ligules* 3–5 mm long. *Blades* 3–10 mm broad. *Panicles* 2–7 (–8) cm long and 8–13 mm thick. *Glumes* 5–6 mm long, the keels with greenish wing 0.2–0.5 mm broad. *Lemmas* 3–4 mm long, shiny, hirsute. *Reduced florets* narrow, somewhat unequal, $\frac{1}{3}$ – $\frac{1}{2}$ as long as lemma and appearing as scales at its base. *Caryopsis* 1.7–2 mm long.

Southern USA and northern México, at low elevations in grasslands and open woodlands, often on disturbed soils. BAJA CALIFORNIA NORTE: Occasional near W coast at N edge of desert (San Quintín, 10 m; Cañada Pabellón, 100 m; Rancho Arenoso, 500 m; Mesa San Carlos, 525 m); Isla Guadalupe.

3. *Phalaris angusta* Nees ex Trin., Gram. Icon. 1: pl. 78. 1827. TIMOTHY CANARYGRASS. Annual with thick succulent culms and glabrous herbage. *Ligule* a broad whitish membrane 3–5 mm long. *Blades* flat, mostly 6–18 cm long and 5–12 mm broad. *Panicles* 6–15 cm long and 8–10 mm thick. *Glumes* 3.5–4 mm long, the keel scabrous and narrowly winged towards apex. *Lemma* of perfect floret thick, shiny, ovate-attenuate, hispid, with two subequal scalelike reduced florets ca. 1 mm long at base.

Mississippi to California and northern Baja California; also southern South America. BAJA CALIFORNIA NORTE: Bank of drying pool in arroyo 4 km NW of El Dorado, Valle las Palmas, 350 m (Moran 27093).

4. *Phalaris minor* Retz., Obs. Bot. 3:8. 1783. LITTLESEED CANARYGRASS. Tufted annual generally similar to *P. caroliniana* but with only 1 scale-like rudimentary floret below perfect floret.

Scattered throughout North America, introduced from the Mediterranean region. BAJA CALIFORNIA NORTE: Weed of grassy slopes, roadside ditches, and vernal pools, fairly common in the NW below 1400 m, S to San Quintín; Islas Todos Santos and Guadalupe.

5. *Phalaris lemmonii* Vasey, Contr. U.S. Natl. Herb. 3:42. 1892. Tufted annual with culms 30–90 cm tall. *Blades* 3–9 mm broad. *Panicles* 5–15 cm long, subcylindrical, often purplish. *Glumes* ca. 5 mm long, narrow, scabrous, acuminate, not winged on keel. *Reduced florets* 1 or 2, $\frac{1}{3}$ or less as long as lemma. *Lemma* lance-ovate, acuminate, 3.5–4 mm long, strigose except at acuminate tip, brown at maturity.

Moist places at low elevations, California and re-



Fig. 29. *Phalaris caroliniana*: plant, spikelet, fertile floret with rudiments at base. From Gould and Box, 1965.

portedly Baja California. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:930) from "Creosote Bush Scrub of higher desert areas, upward into Mixed Evergreen Forest, Sierra Juárez". We have seen no specimens.

6. *Phalaris arundinacea* L., Sp. Pl. 55. 1753. REED CANARYGRASS. Stout perennial with creeping rhizomes and glabrous culms erect to 1.5 m. *Ligules* 5–8 mm long. *Blades* 6–15 mm broad. *Panicles* 5–20 cm long, with branches to 5 cm long spreading at anthesis. *Glumes* 4.5–6 mm long, the keel not or scarcely winged, scabrous. *Lemmas* 3–4 mm long, shiny, somewhat appressed-hairy. *Reduced florets* ca. 1 mm long, villous.



Fig. 30. *Gastridium ventricosum*: plant, glumes, floret. From Hitchcock, 1935.

In marshes and wet meadows and along ditch and stream banks, Alaska and Newfoundland to central California, northern Baja California, northern Arizona, Oklahoma, and North Carolina; also Eurasia. Sometimes planted for ornament or forage. BAJA CALIFORNIA NORTE: In dense growth of *Eleocharis macrostachya*, wet ground at edge of natural pond 2 km SE of San Faustino, Sierra Juárez, 1290 m, Moran 29655, 29719.

32. *Gastridium* Beauv.

1. *Gastridium ventricosum* (Gouan) Schinz & Thell., Vierteljahrssch. Natur. Ges. Zurich 58:39. 1913. NITGRASS. Fig. 30. Tufted annual with weak succulent culms. *Ligule* membranous, 3–4 mm long. *Blades* thin, flat, mostly 2–6 mm broad and 3–10 cm long. *Panicles* dense, contracted, 5–8 cm long. *Spikelets* small, 1-flowered, disarticulating above glumes. *Glumes* narrow, 1-nerved, the first 3–5 mm long (excluding awn when present), the second ca. $\frac{3}{4}$ as long as first, both usually tapering to stout straight awn tip. *Lemma* and *palea* ca. 1 mm long, thin, hyaline, the lemma appressed-hispid, indistinctly nerved, with straight or geniculate awn 4–5 mm long from just below apex.

Native to the Mediterranean region; now widely scattered in USA and into Baja California. BAJA CALIFORNIA NORTE: Weed of fields, grassy slopes, and arroyo beds, fairly common in the NW below 1000 m, S to San Telmo.

Tribe 8. Triticeae

33. *Hordeum* L.

Annuals and perennials, mostly with thick weak culms and thin flat blades. *Ligules* membranous. *Blade auricles* often present. *Inflorescence* a spikeate raceme with 3 spikelets at each node, the lateral ones usually pediceled and staminate or sterile, the axis disarticulating at nodes at maturity (except in *H. vulgare*), the short internodes falling with spikelets attached. *Spikelets* 1-flowered, the lateral often represented by glumes only. *Glumes* narrow, usually awned. *Lemmas* rounded on back, 5-nerved, usually obscurely so, usually with stout or slender awn from apex.

1. Glumes not ciliate.
2. Lemma awn of central spikelet 2–7 mm long.
3. Inner glumes of lateral spikelets conspicuously broadened and flattened below; outer glumes setaceous; annual 1. *H. pusillum*
3. Inner glumes of lateral spikelets not conspicuously broadened and flattened below; all glumes setaceous; perennial 2. *H. brachiantherum*

- 2. Lemma awn of central spikelet more than 10 mm long.
- 4. Lemma awn of central spikelet 11–22 mm long; annuals.
 - 5. Lemmas of lateral spikelets awnless; body of lemma of central spikelet 8–9 mm long ----- 4. *H. depressum*
- 5. Lemmas of lateral spikelets awned.
 - 6. Body of lemma of central spikelet 8–9 mm long; inflorescence 3–12 cm long ----- 3. *H. arizonicum*
 - 6. Body of lemma of central spikelet about 5 mm long; inflorescence 1.5–3 cm long ---- 5. *H. hystrix*
- 4. Lemma awn of central spikelet 3.6–15 cm or more long.
 - 7. Lemma awns 3.6–6 (–8) cm long; lateral spikelets pediceled; weak perennial ----- 6. *H. jubatum*
 - 7. Lemma awns 5–15 cm long; all spikelets sessile; annual ----- 7. *H. vulgare*
- 1. Glumes of central spikelet and inner glumes of lateral spikelets ciliate with spreading hairs.
- 8. Inflorescence with 3–5 nodes per cm of rachis; cilia of rachis 0.1–0.3 mm long ----- 8. *H. leporinum*
- 8. Inflorescence with 6–8 nodes per cm of rachis; cilia of rachis 0.25–0.75 mm long ----- 9. *H. glaucum*

1. ***Hordeum pusillum*** Nutt., Gen. Pl. 1:87. 1818. LITTLE BARLEY. Fig. 31. Tufted annual with culms mostly 10–40 cm tall. *Ligules* ca. 0.5 mm long. *Blades* glabrous or pubescent, mostly 2–4 (–5) mm broad, with or without small auricles. *Inflorescence* mostly 4–8 cm long and 4–8 mm broad excluding awns. *Awns of glumes* 7–15 mm long. *Lemmas* of lateral spikelets short-awned, irregularly reduced; lemmas of central spikelets usually 4–6 mm long, with awn 2–7 mm long. *Rachilla* extended behind palea as stout bristle 2–4 mm long.

Widespread in North America, from Canada to northern Mexico, frequent along roadways, ditches, and other disturbed sites; commonly associated with *Vulpia octoflora* on and around anthills. BAJA CALIFORNIA NORTE: In ditches and in and about vernal pools below 300 m in the NW (Tijuana, Valle las Palmas, Rosarito, El Descanso, Colonia Guerrero, Eréndira, San Quintín); salt flat NW of Punta Blanca (29°12'N), 5 m.

2. ***Hordeum brachyantherum*** Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, 2:61. 1936. MEADOW BARLEY. Tufted perennial without rhizomes or stolons. *Culms* mostly 15–70 cm tall. *Leaves* glabrous or lowermost pilose. *Blades* linear, 3–8 mm broad, the auricles absent or vestigial. *Inflorescence* similar to that of *H. pusillum* but none of glumes broadened at base and florets of lateral spikelets often entirely reduced.

Widespread in cooler parts of North America, ranging southward in the western mountains to Baja California. BAJA CALIFORNIA NORTE: Fairly com-



Fig. 31. *Hordeum pusillum*: plant, rachis joint with spikelet cluster. From Gould and Box, 1965.

mon in meadow, La Grulla, Sierra San Pedro Mártir, 2200 m (Moran & Thorne 14487).

3. ***Hordeum arizonicum*** Covas, Madroño 10:16. 1949. *H. adscendens* Hitchc. not H.B.K. Annual with culms 20–60 cm tall. *Lower sheaths* pubescent; upper sheaths glabrous. *Blades* 3–5 mm broad, sparsely pubescent. *Inflorescence* erect, 3–12 cm long. *Lemma of central spikelet* 8–9 mm long, with awn 15–22 mm long. *Lateral florets* reduced to short-awned lemma, the outer glume slightly dilated.

Arizona to southern California and northern Mexico. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:926) from "irrigated fields and along ditches, Imperial Co., California, and adjacent NE B.C.". We have seen no specimens.

4. ***Hordeum depressum*** (Scribn. & Sm.) Rydb., Bull. Torrey Bot. Club 36:539. 1909. *H. nodosum*

var. *depressum* Scribn. & Sm. Tufted annual with culms usually geniculate-spreading below, 6–45 cm long. Upper sheaths often inflated. Blades mostly 5 cm or less long, 2–4 mm broad, lacking auricles. Inflorescence erect, 4–7 cm long. Lemma of central spikelet 7–8 mm long, nearly terete, with awn about 10 mm long. Glume awns of central and lateral spikelets all about 2 cm long. Lemmas of lateral spikelets awnless.

British Columbia and Idaho to California. Reported by Wiggins (1980:926) from "moist alkaline depressions and flats, N B.C.". We have seen no specimens.

5. *Hordeum hystrix* Roth, Cat. Bot. 1:23. 1797. *H. gussonianum* Parl. Low annual with culms freely branching and spreading at base. Sheaths and blades, especially lower ones, often pubescent. Sheath auricles lacking. Inflorescence erect, 1.5–3 cm long, the rachis usually not breaking easily. Glumes setaceous, rigid, about 12 mm long. Lemma of central spikelet about 5 mm long, with awn somewhat longer than glumes. Lateral spikelets reduced, short-awned.

Native to Europe; widespread in western and sporadic in eastern North America as a weed of disturbed areas. BAJA CALIFORNIA NORTE: Roadside 11 km SE of La Misión de San Miguel, 260 m (Moran 28349); marshy ground N of Las Juntas, Sierra Juárez, 925 m (Moran 28728).

6. *Hordeum jubatum* L., Sp. Pl. 85. 1753. FOXTAIL BARLEY. Tufted short-lived perennial, often appearing annual. Culms mostly 25–60 cm tall, erect or geniculate-spreading. Leaf blades glabrous or lowermost finely hairy. Inflorescence 5–10 cm long and about 1 cm broad, pale green or reddish, conspicuously bristly with long slender spreading awns. Lateral spikelets greatly reduced, often represented only by slender awn-like scabrous glumes and short rachilla. Glumes of central spikelet also awnlike and scabrous, ca. as long as those of the lateral spikelets. Floret of central spikelet slender and awned, the lemma body mostly 4–7 mm long, the awn 3.6–6 (–8) cm long. Rachilla extended as slender bristle back of palea.

Alaska and Labrador to Mexico, often along streams, lakes, and moist meadows. BAJA CALIFORNIA NORTE: Upper Arroyo Agua Caliente, N of Cerro Chato, S end of Sierra San Pedro Mártir, 1500 m (Moran 11097).

7. *Hordeum vulgare* L., Sp. Pl. 84. 1753. CEBADA, BARLEY. Annual with succulent culms to 120 cm

tall. Ligules mostly 1.5–3 mm long. Blades 5–15 mm broad, usually with firm well-developed auricles. Spikes closely flowered, 2–10 cm long excluding awns, with 3 sessile perfect spikelets at each node of non-disarticulating rachis. Glumes slightly flattened and broadened at base, tapering to long or short awn. Lemmas mostly with body 8–12 mm long and awn as much as 15 cm long.

An Old World species, now widely cultivated as a food plant in the cooler parts of the world and occasional as a temporary weed of roadsides, ditchbanks, and field borders. In the warmer climates of southern North America, barley grows as a cool-season grass. BAJA CALIFORNIA NORTE: Occasional at roadsides in the NW wherever it is grown, apparently not persisting.

8. *Hordeum leporinum* Link, Linnaea 9:133. 1835. *H. murinum* of Hitchcock (1913), not L. HARE BARLEY. Tufted annual with geniculate-erect culms mostly 15–60 cm tall. Leaves glabrous or hispid. Ligules truncate, about 1 cm long. Blades 3–8 mm broad, usually with well-developed slender, pointed auricles. Inflorescence 4–8 cm long and ca. 1 cm broad excluding awns. Florets of lateral spikelets usually as large as or larger than those of central spikelets. Floret of central spikelet borne on elongated rachilla joint. Glumes with awns mostly 1–2.5 cm long, the glumes of central spikelet and inner glumes of lateral spikelets coarsely ciliate and more or less broadened and flattened below. Body of lemma of central spikelet 6–12 mm long, with awn 1–4 cm long. Anthers of central floret exerted at anthesis.

Native to Europe; now widespread in northern and western North America, a weed of roadsides, field borders, vacant lots, and waste places. BAJA CALIFORNIA NORTE: At low elevations in the NW, not so common as *H. glaucum*; Islas los Coronados, Todos Santos, San Martín, and Guadalupe.

9. *Hordeum glaucum* Steud., Syn. Plant. Glum. 1:352. 1855. *H. stebbinsii* Covas. GLAUCOUS BARLEY. Generally similar to *H. leporinum*, differing in relatively minor morphological characteristics. In addition to having shorter rachilla joints and thus more spikelets per cm of rachilla, *H. glaucum* has anthers that are included at anthesis.

Native to the Mediterranean region; a widespread weed in western North America. BAJA CALIFORNIA NORTE: Common in the NW, from coast to 2200 m in Sierra San Pedro Mártir; S into desert; Islas los Coronados, Todos Santos, Guadalupe, and Cedros.

34. *Elymus* L.

Erect perennials, many with rhizomes. *Ligules* membranous. *Blades* usually flat, with slender pointed auricles. *Inflorescence* a spike, a spicate raceme, or, in *E. condensatus*, a contracted spike-like panicle. *Spikelets* with 2 to several florets. *Glumes* variable, narrow and setaceous to broad, awnless or awned. *Lemmas* usually 5–7-nerved, rounded on back, awnless or long-awned. *Paleas* about as long as lemmas.

1. Glumes with awns 2–5 cm long.
 2. Glumes entire or 2-cleft 1. *E. longifolius*
 2. Glumes cleft into at least 3 divisions 2. *E. multisetus*
1. Glumes awnless or with awns to 1 cm long.
 3. Spikelets 1–2 per node.
 4. Lemmas with awns 1–3 cm long; plants without rhizomes 3. *E. glaucus*
 4. Lemmas awnless or with awns less than 5 mm long; plants with creeping rhizomes 4. *E. triticoides*
 3. Spikelets 3 to several per node, the nodes often with combinations of sessile spikelets and spikelets on short branches 5. *E. condensatus*

1. *Elymus longifolius* (J. G. Sm.) Gould, Brittonia 26:60. 1974. *Sitanion longifolium* J. G. Sm. TRI-GUILLO DESÉRTICO, LONGLEAF SQUIRRELTAIL. Short-lived tufted perennial. *Culms* mostly 25–60 cm tall. *Sheaths* glabrous or puberulent, those subtending inflorescences inflated. Slender, fragile auricles usually developed at apex of sheath. *Ligule* a minute membranous collar. *Inflorescence* 7–15 cm long, the rachis readily disarticulating at maturity. *Spikelets* 2–6-flowered. *Glumes* subulate, scabrous, usually 1-nerved. *Lemmas* 7–12 mm long, glabrous to pubescent, obscurely 3–5-nerved, narrowed to stout awn 5–10 cm long.

Montana and South Dakota to Texas and northern Mexico, in desert and dry mountain habitats. BAJA CALIFORNIA NORTE: Fairly common in the NW in higher chaparral and in pine forest; Sierra Juárez, 1300–1700 m (La Rumorosa, El Mezquite, Tres Pozos, Laguna Hanson); Cerro Piñon, N of Alamos, 1200–1450 m; Sierra San Pedro Mártir, 1500–2600 m (Cerro Venado Blanco, Yerba Buena, Los Llanitos, Concepción, La Joya, ex-misión San Pedro Mártir); Cerro Matomí, 1600 m; also Cerro Potrero (29°49'N), 1400 m.

Sonoran Desert collections of this species were referred by Swallen (1964:252) and by Wiggins (1980:929) to *Sitanion hystrix* (Nutt.) J. G. Sm.; and plants of SW USA were referred by Gould (1951) to *Elymus elymoides* (Raf.) Swezey.

2. *Elymus multisetus* (J. G. Sm.) Davy, Univ. Calif. Publ. Bot. 1:57. 1902. *Sitanion jubatum* J. G. Sm.

Differing from *E. longifolius* only in the 3–4-cleft and 3–4-awned glumes; probably not specifically distinct.

Washington and Idaho to Utah, Arizona, and California. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:929) from “brushy and rocky slopes, Sierras Juárez and San Pedro Mártir”, but we have seen no specimens.

3. *Elymus glaucus* Buckl., Proc. Acad. Nat. Sci. Philadelphia 1862:99. 1862. Tufted perennial with loosely clumped slender culms mostly 50–100 cm tall. *Blades* flat, bluish-green, 4–10 mm broad. *Inflorescence* slender, 8–20 cm long, with persistent (not disarticulating) rachis with usually 1 spikelet at upper and lower nodes and 2 at middle nodes. *Glumes* 3–7-nerved, awnless or with awn to 6 mm long. *Lemmas* scabrous, with terminal awn 1–3 cm long.

Western North America from Alaska to Baja California in open woods and meadows and on dry slopes. BAJA CALIFORNIA NORTE: Apparently uncommon; NE cliffs, Cerro del Coronel, 650 m (Moran 22451); Sauzal (Orcutt 1427); sandy soil near stream, La Joya, Sierra San Pedro Mártir, 1500 m (Moran 23315).

4. *Elymus triticoides* Buckl., Proc. Acad. Nat. Sci. Philadelphia 1862:99. 1862. Fig. 32. CREEPING WILD-RYE. Perennial with erect, slender, glabrous and usually glaucous culms mostly 40–80 (occasionally 100 or more) cm tall, single or in small clusters from rhizomatous base. *Blades* usually narrow, stiff, glaucous. *Spikes* 6–20 cm long, the spikelets usually solitary at upper nodes and 2 or occasionally 3 at other nodes, occasionally solitary at all nodes. *Spikelets* mostly 10–16 mm long and 4–6-flowered. *Glumes* firm, narrow, subulate, variable in length but about as long as lowermost lemma, widely separated. *Lemma* smooth or slightly scabrous, acute or with minute awn tip.

Washington and Montana to Texas and Baja California. This is one of few *Elymus* species to flourish as a weed of city lots and roadsides in western USA. BAJA CALIFORNIA NORTE: Arroyos along NW coast (Cantiles; NW of La Misión; S of Boca La Misión; mesa N of Cabo Colonet); meadows in Sierra Juárez, 1000–1600 m (Las Juntas; La Hechicera; SE of Japá; NE of Ojos Negros; El Topo).

A collection from between Maneadero and San Carlos hot springs (Beetle M-2845) was identified by the collector as *Agropyron repens* (L.) Beauv. On the TAES specimen the spikelets are all solitary



Fig. 32. *Elymus triticoides*: a, node with group of spikelets; b, floret with lemma removed; c, leaf sheath and ligule; d, floret; e, plant; f, spike. From Mason, 1957.

at the nodes as in most species referred to *Agropyron*. However, slender specimens of *E. triticoides* also may have only one spikelet per node, and we tentatively refer this specimen here.

5. *Elymus condensatus* Presl, Rel. Haenk. 1:265. 1830. GIANT RYEGRASS. Stout perennial with short thick rhizomes. Culms in dense clumps, mostly 1.5–3.5 m tall. Blades flat, long, strongly nerved, mostly 12–30 mm broad. Inflorescence a spike or contracted panicle typically 15–50 cm long and with short often compound branches in addition to spikelets at one to several nodes. Spikelets mostly 10–15 mm long and 3–6-flowered. Glumes narrow, tapering to sharp point. Lemmas glabrous to strigose, acute or short-awned.

California and northern Baja California. BAJA CALIFORNIA NORTE: Fairly common in chaparral

and coastal sage scrub in arroyos and on rocky slopes below 700 m in the NW, S to San Antonio del Mar; Islas los Coronados and Todos Santos.

35. *Triticum* L.

1. *Triticum aestivum* L., Sp. Pl. 85. 1753. TRIGO, WHEAT. Annual with thick weak culms mostly 60–100 cm tall. Sheaths usually with slender auricles laterally at apex. Ligule a truncate membrane mostly 1–3 mm long. Blades flat, elongate, 0.7–2 cm broad. Spikes 5–12 cm long excluding awns when present, the spikelets solitary at nodes, 2-ranked and closely imbricated on stout persistent rachis. Spikelets 10–15 mm long excluding awns, 2–5-flowered. Glumes usually mucronate or awned. Lemmas awnless, mucronate, or with stout scabrous awn to 15 cm or more long. Palea well-developed, ca. as long as lemmas.

Native to Eurasia; cultivated throughout the cooler parts of the world and grown as a cool season grass in subtropical regions. Occasional as a roadside escape but probably not persisting out of cultivation: hence localities of collection mean little. BAJA CALIFORNIA NORTE: La Rumorosa; Tecate; Colonia Guerrero; Islas San Martín and Cedros. BAJA CALIFORNIA SUR: 148 km NW of La Paz.

36. *Agropyron* Gaertn.

Annuals and perennials generally similar to *Elymus* but artificially separated by the presence of only one spikelet per node of the inflorescence.

1. Glumes thin, acute to short-awned, $\frac{2}{3}$ or more as long as spikelet; anthers 1–2 mm long ---- 1. *A. trachycaulum*
1. Glumes indurate, obtuse to truncate, half as long as spikelet; anthers 4–5 mm long ----- 2. *A. elongatum*

1. *Agropyron trachycaulum* (Link) Malte, Ann. Rpt. (1930) Natl. Mus. Canada 42. 1932. *A. subsecundum* (Link) Hitchc. *Elymus trachycaulus* (Link) Shinn. AGROPIRO, BEARDED WHEATGRASS. Fig. 33. Perennial with slender culms 40–100 cm or more tall in small clumps, developing slender rhizomes in some habitats. Blades elongate, flat or folded, 2–6 mm broad. Spikes slender, 4–12 (–20) cm long, the spikelets rather widely spaced. Spikelets mostly 12–20 mm long and 4–6-flowered. Glumes thin, broad, lanceolate, strongly 5- (3–7-) nerved, mostly 9–15 mm long, usually tapering to short awn. Lemmas 8–13 mm long, glabrous, awnless or with straight awn to 2 cm long.

Throughout northern and western North America, ranging south at medium to high elevations to Arizona, California, and Baja California, on brushy

or forested slopes and in mountain meadows. BAJA CALIFORNIA NORTE: E of Piedras Gordas, 620 m; Sierra Juárez (Las Juntas, 900 m); Sierra San Pedro Mártir, 1500–2500 m (Yerba Buena; Los Llanitos; La Grulla; La Víbora; La Joya).

2. *Agropyron elongatum* (Host) Beauv., Ess. Agrost. 102, 146, 180, 1812. Glaucous tufted perennial with stiffly erect culms 0.5–1.5 m tall, lacking rhizomes. *Blades* flat to loosely involute, 3–6 mm wide. *Spikes* 15–35 cm long; lower internodes much exceeding spikelets. *Spikelets* 15–22 mm long, 6–12 flowered. *Glumes* thick, oblong, 6–10 mm long, 5–9-nerved. *Lemmas* 8–11 mm long, obtuse to rounded, awnless.

Native to Europe; adventive in western North America, where sometimes planted for erosion control. BAJA CALIFORNIA NORTE: Moist soil near pond 2 km SE of San Faustino, Sierra Juárez, 1290 m, Moran 29639, 29721.

37. *Secale* L.

1. *Secale cereale* L., Sp. Pl. 84, 1753. CENTENO, RYE. Annual with erect hollow culms 50–120 cm tall, branching only at base. *Sheaths* rounded on back, auriculate or not, glabrous or lower sheaths hispid. *Ligule* a ciliate membrane mostly 1–1.5 mm long. *Blades* thin, flat, glabrous or hirsute on one or both surfaces. *Inflorescence* a dense bilateral spike mostly 5–12 cm long and ca. 1 cm thick. *Spikelets* awned, usually 2-flowered, borne singly and closely imbricated on flattened rachis. *Rachis* densely hairy on margins, continued above upper floret as short stipe. Disarticulation above glumes. *Glumes* subequal, narrow, acute or acuminate, apparently 1-nerved, 6–10 mm long. *Lemmas* broad, firm, 5-nerved, sharply ciliate on midnerve and exposed margins, tapering to stout scabrous awn 1.5–6 cm or more long. *Paleas* hyaline, ca. as long as body of lemma, with green nerves.

The rye of commerce, native to Europe, grown frequently in USA and to a lesser extent in Mexico; occasional in cereal-growing areas as a roadside escape. BAJA CALIFORNIA NORTE: Sierra Juárez: roadside near rye field, Agua Hechicera, 1175 m, Moran 29617; arroyo bank, San Faustino, 1290 m, Moran 29638.

Tribe 9. Monermeae

38. *Parapholis* C. E. Hubb.

1. *Parapholis incurva* (L.) C. E. Hubb., Blumea Suppl. 3:14, 1946. *Pholiurus incurvus* (L.) Schinz.



Fig. 33. *Agropyron trachycaulum*. From Hitchcock, 1935.

SICKLE GRASS. Fig. 34. Low tufted annual, with curving-erect much-branched leafy culms terminating in stiffly curved slender cylindrical spikes. *Culms* mostly 5–35 cm long including inflorescences. *Leaves* glabrous. *Ligule* membranous, about 1 mm long. *Blades* thin, weak, soon withering, 0.5–2 mm broad. *Spikes* 3–10 cm long, disarticulating at nodes of rachis. *Spikelets* 1-flowered, solitary at nodes and partially embedded in rachis joint. *Glumes* 3–6 mm long, flat, several-nerved, placed in front of spikelet and appearing as halves of single glume. *Lemmas* thin, 1-nerved, awnless, shorter than glumes.

Native to Europe; now established in USA as a weed of roadsides, ditches, and other disturbed soils on the Atlantic Coastal Plain, along the Gulf of Mexico, and on the California coast. BAJA CALIFORNIA NORTE: Abundant locally in sandy to heavy clay soils below 100 m along NW coast, in arroyo bottoms, roadside ditches, vernal pools, and upper salt marsh (N to S of Rosarito; S of Boca la Misión; Cerro Solo to mesa N of Cabo Colonet).

39. *Monerma* Beauv.

1. *Monerma cylindrica* (Willd.) Coss. & Dur., Expl. Sci. Alger. 2:214, 1855. Fig. 35. Tufted weak-stemmed annual with culms 25–50 cm tall, freely branched above. *Herbage* glabrous. *Ligule* membranous, broadly rounded and becoming lacerate in age, 0.5–1 mm long. *Blades* thin, flat, mostly 8–15 cm long and 1–3 mm broad. *Inflorescence* a slender



Fig. 34. *Parapholis incurva*: a, erect culm; b, leaf sheath, ligule, blade; c, part of spike; d, plant. From Mason, 1957.

stiffly erect spike mostly 8–15 cm long, the one-flowered spikelets single at nodes and partially sunken in the thick, somewhat fleshy rachis; rachis disarticulating, each spikelet falling with a section of it. *First glume* absent except on terminal spikelet. *Second glume* large, firm and several-nerved on back, thin and membranous on margins, acute at tip, longer than rachis section to which it is attached, oriented with back away from rachis. *Lemmas* thin, hyaline, 3-nerved, awnless, shorter than glume. *Palea* thin and hyaline.

Native to Europe; adventive in southern California and northern Baja California. BAJA CALIFORNIA NORTE: Abundant locally, often in heavy clay soil, below 50 m along NW coast, in vacant lots, roadside ditches, arroyo bottoms, and edge of salt marsh: San Antonio; Rosarito; S of Boca la Misión; El Ciprés; San Quintín (fide Wiggins 1980:926).



Fig. 35. *Monerma cylindrica*: a, leaf sheath, ligule, blade; b, part of spike; c, spikelet, embedded in rachis; d, plant. From Mason, 1957.

Subfamily IV. ERAGROSTOIDEAE

Tribe 10. Eragrosteae

40. *Eragrostis* von Wolf

Annuals and perennials, mostly cespitose but a few with rhizomes or creeping stolons. *Ligule* a ring of hairs. *Spikelets* awnless, few- to many-flowered, in open or contracted panicles. *Glumes* hyaline, 1-nerved. *Lemmas* 3-nerved, usually disarticulating with glumes and fruit from rachilla, leaving paleas attached to rachilla. *Grain* lenticular to subellipsoidal or nearly spherical, tapering to apex or tending to be truncate at both ends.

This treatment is based largely on the concepts of *Eragrostis* presented by Stephen Koch in personal communication to Gould and in his analysis of the *E. pectinacea-pilosa* complex of North America (1974) and by LeRoy Harvey in *The Grasses of Texas* (Gould, 1975).

1. Plants perennial.
 2. Panicles densely contracted and densely flowered, the branches appressed, mostly about 5 mm long; spikelets sessile, 1.5–2 mm long ---- 1. *E. spicata*
 2. Panicles open, with long spreading branches; spikelets long pedicelled, 4–7 mm long ---- 2. *E. intermedia*
1. Plants annual.
 3. Paleas coarsely ciliate on nerves ----- A
 3. Paleas glabrous or ciliate with hairs less than 0.1 mm on nerves ----- AA

A

4. Panicles densely contracted, usually 0.5–1 cm broad, with short appressed or slightly spreading densely flowered branches and subsessile spikelets 3. *E. ciliaris*
4. Panicles narrow but with spreading branches and pedicels, mostly 1–3 cm broad, the branches not densely flowered, the spikelets on short or long pedicels.
 5. Panicle branches viscid; spikelets mostly 3–4 mm long; pedicels mostly much shorter than spikelets; cilia of palea 0.4–0.8 mm long ----- 4. *E. viscosa*
 5. Panicle branches not viscid; spikelets mostly 1.5–2 mm long; pedicels mostly longer than spikelets; cilia of palea 0.2–0.4 mm long ----- 5. *E. tenella*

AA

6. Plants low, stoloniferous, mat-forming, the erect culms mostly 5–15 cm tall.
 7. Plants dioecious; anthers 1.5–2 mm long -- 6. *E. reptans*
 7. Plants with perfect flowers; anthers about 0.2 mm long ----- 7. *E. hypnoides*
6. Plants with culms decumbent or erect at base but never stoloniferous and mat-forming.
 8. Keels of lemmas and lower margins of blades with crateriform glandular pits; spikelets many-flowered, broadly ovate or oblong, 2–4 mm broad at maturity ----- 8. *E. cilianensis*
 8. Keels of lemmas and lower margins of blades without glandular pits; spikelets few- to several-flowered, broad or narrow.
 9. Caryopsis pyriform to narrowly ovoid, narrowly or broadly pointed at base and apex, not conspicuously 3–4-angled and not with broad groove on surface opposite embryo; spikelets appressed to branchlets or spreading.
 10. Spikelets appressed to branchlets, the pedicels rarely spreading at angle of more than 20 degrees ----- 9. *E. pectinacea*
 10. Spikelets spreading from branchlets at maturity, the pedicels usually spreading at angle of more than 20 degrees.
 11. First glume usually more than ½ as long as lowermost lemma; paleas persistent; spikelets, 1.2–2.5 mm broad; panicle branches at lower nodes usually 1 or 2, rarely more ----- 10. *E. tephrosanthos*
 11. First glume usually ¼–½ as long as lowermost lemma; paleas deciduous, at least on some spikelets; spikelets 0.5–1.1 mm broad; panicle branches at lower nodes usually 3 to several 11. *E. pilosa*
 9. Caryopsis broad, 3-sided or 4-sided, abruptly narrowed at both ends and often truncate at apex, with broad groove on side opposite embryo; spikelets spreading from branchlets at maturity.
 12. Spikelets 1.4–2.4 mm broad, ovate in outline ----- 12. *E. mexicana*

12. Spikelets 0.8–1.6 mm broad, oblong ----- 13. *E. orcuttiana*

1. *Eragrostis spicata* Vasey, Bot. Gaz. 16:146. 1891. SPICATE LOVEGRASS. Perennial with culms 75–100 cm tall. Leaves glabrous, the blades linear, flat to involute, 4–8 mm broad. Panicles narrow, dense, 30–35 cm long, 4–5 mm thick, the branches closely flowered, to ca. 5 mm long. Spikelets sessile, 1.5–2 mm long, ca. 1 mm broad, 2–3-flowered. Lemmas greenish-white, ovate, ca. 2 mm long. Paleas ciliate on keels. Grains narrowly ellipsoidal, ca. 1 mm long.

Southern Texas, eastern Tamaulipas, and Baja California Sur, in low open sandy areas. BAJA CALIFORNIA SUR: Cape region: Known only from the type collection (*Brandegge 10*), from San José del Cabo.

2. *Eragrostis intermedia* Hitchc., J. Wash. Acad. Sci. 23:450. 1933. PLAINS LOVEGRASS. Fig. 36. Tufted perennial with slender stiffly erect culms 55–90 cm tall. Sheath pilose at throat. Blades mostly 15–20 cm or more long and 2–3 mm broad, usually glabrous except for few hairs about ligule. Panicles open, usually 20–40 cm long and 15–30 cm broad, the spikelets widely spaced. Pedicels mostly longer than spikelets. Spikelets ovate to narrowly lanceolate, 4–7 mm long, 5–11-flowered, the rachilla usually persistent. Lemmas grayish-green, rounded on back, acute, 1.8–2.2 mm long. Paleas ciliate on keels. Grains oblong, ca. 0.8 mm long.

Southwestern Arkansas to Arizona and through Mexico to Guatemala, on open rocky, clayey, or sandy slopes. BAJA CALIFORNIA NORTE: Rocky slopes, often with other perennial grasses, and sandy arroyo beds: Sierra Juárez, 1000–1700 m (*e.g.* Cerro el Topo; N of Laguna Hanson; Cerro Jamau; SSE of El Rodeo); Sierra San Pedro Mártir (*e.g.* Arroyo el Picacho, 1500 m; Cañón la Providencia, 580 m; SW of La Grulla, 1850 m; Santa Rosa, 2050 m). BAJA CALIFORNIA SUR: Volcán las Tres Vírgenes, 1900 m; Cerro Barranco, Sierra de Guadalupe, 1175 m; Sierra de la Laguna.

In *E. intermedia* we include those Baja California collections cited by Hitchcock (1913:366) as *E. lugens* Nees. If *E. intermedia* is not distinct, as we suppose it to be, then the older name of *E. lugens* must be used.

From the Cape region mountains is cited not only the typical variety of *E. intermedia* but also the var. *oreophila* (L. H. Harv.) Witherspoon [*E. oreophila* L. H. Harv.], with reduced panicles, lacking secondary branches. Harvey (1954:408) cited *Brandeg-*



Fig. 36. *Eragrostis intermedia*: plant, spikelet. From Gould, 1951.

gee 28 of 1902, from the Sierra de la Laguna, and Witherspoon (1977) also mentioned a single Baja California collection. The variety otherwise is common about Jacala, Hidalgo, and also occurs in Nuevo León; and Witherspoon suggested that possibly it was polyphyletic.

3. *Eragrostis ciliaris* (L.) R. Br. in Tuckey, Narr. Exp. Congo. 478. 1818. GOPHERTAIL LOVEGRASS. Tufted annual with spreading culms mostly 10–50 cm tall. *Sheaths* usually pilose at throat and down margins. *Ligule* often not well defined, the blade usually with few long hairs in ligular area. *Blades* flat or folded, 1–3 (–4) mm broad. *Inflorescence* contracted, spikelike, densely-flowered, usually interrupted, mostly 3–10 cm long and 5–7 (rarely 10) mm thick. *Spikelets* subsessile, on pedicels 0.2–0.6 (–1) mm long, mostly 6–9-flowered and 2–2.5 mm long. *Glumes* equal or slightly unequal, shorter than lemmas. *Lemmas* averaging 0.9–1.3 mm long, glabrous or scabrous. *Paleas* ciliate with stiff papilla-based hairs to 0.8 mm long.

Widespread in warm regions of the world, apparently introduced in the Americas. BAJA CALIFORNIA SUR: Low elevations in Cape region: Miraflores

(Purpus 291, Jones 24166, Beetle 2581); San José del Cabo (Brandegge 4).

4. *Eragrostis viscosa* (Retz.) Trin., Mem. Acad. Imp. Sci. St. Petersburg, Ser. 6, Sci. Math. 1:397. 1831. VISCID LOVEGRASS. Tufted shiny-viscid annual with culms 8–50 cm or more tall, a ring of irregular glands below nodes. *Sheaths* with depressed glands towards apex and tuft of hairs on collar. *Blades* 1–3 mm broad. *Panicles* commonly 5–15 cm long and 1–3 cm broad, the branches short, few-flowered, stiffly erect or spreading, these and axis with few to many shallow crateriform glands. *Spikelets* purple-tinged, mostly 5–12-flowered and 3–4 mm long, on pedicels 0.5–3 mm long. *Glumes* broad, unequal, the second ca. as long as lemma. *Lemmas* averaging 1.3–1.5 mm long, truncate at apex. *Paleas* ciliate with stiff spreading white hairs 0.4–0.8 mm long. *Grains* ellipsoid, shining, about 0.8 mm long.

Mexico and Central America, adventive from southeastern Asia, a weedy grass of open sandy soils at low elevations. BAJA CALIFORNIA SUR: Punta Conejo; El Coyote; E of La Paz; 40 km SW of La Paz; N of Santiago; San José del Cabo; Cabo San Lucas; Isla Espíritu Santo.

5. *Eragrostis tenella* (L.) Beauv. ex R. & S., Syst. Veg. 2:576. 1817. *E. amabilis* (L.) Wight & Arn. *E. plumosa* (Retz.) Link. Tufted annual with weak slender culms 10–20 (–35) cm long. *Sheaths* usually pubescent on upper margins and with few long hairs on collar. *Ligule* minute or absent. *Blades* thin, flat, 1–5 mm broad, often with few long hairs just above ligular area. *Inflorescence* open but narrow, mostly 4–9 cm long and 1.5–3 cm broad, with numerous short spreading freely rebranched branches. *Pedicels* mostly longer than spikelets. *Spikelets* usually ca. 2 mm long and 3–8-flowered. *Glumes* acute, unequal, the second ca. as long as lowermost lemma, the first shorter. *Lemmas* ca. 1 mm long, glabrous, purplish or silvery and with bright green nerves. *Paleas* ciliate with stiff hairs 0.2–0.4 mm long. *Grains* 0.5–0.6 mm long, ellipsoid, shining.

Native to the Old World but now widely distributed in warmer parts of both hemispheres, a weedy grass of open sandy often disturbed soils. BAJA CALIFORNIA SUR: At low elevations along irrigated fields, ponds, and ditches in Cape region: La Paz; Valle Perdido; La Ribera; Miraflores; San José del Cabo; Cabo San Lucas.

Brandegge collections from San José del Cabo were reported by Hitchcock (1913:361) as *E. plumosa*.

6. *Eragrostis reptans* (Michx.) Nees, Agrost. Bras. 514. 1829. *Neeragrostis reptans* (Michx.) Bush. CREEPING LOVEGRASS. Mat-forming dioecious annual with stoloniferous much-branched culms, the erect floriferous tips 5–10 (–20) cm tall including inflorescence. Culms wiry, many-noded. Sheaths shorter than culm internodes. Blades flat or folded, 1–5 cm long, 1–2 mm broad, glabrous or pubescent. Staminate and pistillate inflorescences similar, capitate, with small cluster of short-pedicel spikelets on very short axis. Spikelets ovate to linear, variable in size and shape but mostly 0.8–2 cm long and with 16–40 (–60) florets. Glumes thin, 1-nerved, unequal, acute. Lemmas thin, strongly 3-nerved, acute, acuminate or short-awned, glabrous to hirsute, usually 2.6–3.3 mm long. Paleas of staminate spikelets ca. as long as lemmas; paleas of pistillate spikelets only half as long, persistent, not falling with lemmas at maturity. Anthers mostly 1.5–2 mm long. Caryopsis brownish, ca. 0.5 mm long.

Southern USA and northern Mexico, along shores of streams and lakes, often forming dense mats on the mud of drying ponds and lake beds. BAJA CALIFORNIA SUR: Vicinity of Comondú (Carter 4319, Carter & Ferris 3427); Llanos de San Julio (Gentry 4168); Sierra de la Giganta (Wiggins 15511).

Although Gould (1975) followed Nicora (1962) in recognizing *Neeragrostis* Bush (1903) with this one species, we now follow Koch (1978) in returning it to *Eragrostis*.

7. *Eragrostis hypnoides* (Lam.) B.S.P., Prelim. Cat. N.Y. City. 69. 1888. TEAL LOVEGRASS. Mat-forming annual with culms creeping and rooting at lower nodes, the erect branches 10–15 (–25) cm tall. Sheaths much shorter than culm internodes, usually pilose at throat. Blades flat, appressed-pilose, mostly 0.5–2.5 cm long and 0.5–1.5 mm broad. Panicles open, few-flowered, 2–5 cm long. Spikelets short-pedicellate, lanceolate to narrowly ovate, 5–12 mm long, 1.5–2.5 mm broad, 8–22-flowered. Glumes hyaline, acuminate, the second ca. as long as lowermost lemma, the first shorter. Lemmas greenish-white, 1.8–2 mm long, with conspicuous lateral nerves. Paleas minutely ciliolate on keels. Grains discoid, ca. 0.6 mm long.

Widespread in the United States and south to Mexico, the West Indies, and adjacent South America, on the margins and beds of dry or drying lakes and ponds and on mud and sand bars along streams. BAJA CALIFORNIA SUR: Hitchcock (1913:360) reported Brandegee collections from San Gregorio and Comondú.

8. *Eragrostis cilianensis* (All.) E. Mosher, Bull. Illinois Agr. Exp. Sta. 205:381. 1918. *E. megastachya* Link. AMORSECO CILIADO, STINKGRASS. Annual with thick weak culms 10–60 cm or more long. Sheaths rounded, glabrous except for few hairs at apex. Ligule a ring of soft hairs. Blades thin, flat, elongate, glabrous, narrow or broad, occasionally to 8 mm broad. Panicles usually yellowish-green or grayish-green, variable in size, few- to many-flowered, the relatively large spikelets short pedicel. Spikelets extremely variable in size but usually 6–20 mm long, 2–4 mm broad, and with 12–40 florets. Glumes similar to lemmas in texture but smaller, often with 1–3 glands on keel, early deciduous. Lemmas acute to obtuse, 2.2–2.8 mm long and ca. 1.2 mm broad, usually glandular-pitted on keel. Paleas ciliolate on keels, persistent.

Native to Europe; now widespread in USA, Mexico, and Central and South America, a weed of roadsides, ditches, gardens, and waste places that are periodically moist. In Baja California also in remote and relatively undisturbed places. BAJA CALIFORNIA NORTE: Widespread but usually not common in the NW, from coast to ca. 1500 m in Sierras Juárez and San Pedro Mártir. BAJA CALIFORNIA SUR: Widespread and often collected, perhaps one of the commonest weedy grasses.

Eragrostis cilianensis grows and flowers at any time of year when sufficient moisture is available.

9. *Eragrostis pectinacea* (Michx.) Nees, Fl. Afr. Austr. 406. 1841. *E. diffusa* Buckl. Fig. 37. Tufted annual with erect or geniculate-spreading culms mostly 20–60 cm tall. Sheaths glabrous except for few long hairs at apex. Ligule a ring of short soft hairs. Blades thin, linear, flat to folded, glabrous or scabrous, 1–4.5 mm broad. Panicles mostly 10–30 cm long, the primary branches spreading. Pedicels appressed to branches at maturity, rarely spreading as much as 20 degrees. Spikelets 5–8 mm long, 1–2 mm broad, 8–15-flowered. Glumes unequal, the second slightly shorter than lowermost lemma. Lemmas dark grayish-green to light green, 1.8–2.2 mm long. Paleas hyaline, finely ciliolate on keels, persistent. Caryopsis pyriform to narrowly ellipsoidal, without groove opposite embryo, 0.8–1 mm long.

Georgia and the upper Mississippi Valley to Kansas, Texas, southern California, and northern Mexico, on open well-drained often disturbed sites. BAJA CALIFORNIA NORTE: Sierra Juárez: Cañada el Rincón, 1440 m (Moran & Reveal 25185 ¹/₂); El Alamito, 1000 m (Moran 18648 ¹/₂). Sierra San Pedro Mártir: La Encantada, 2200 m (Moran & Thorne



Fig. 37. *Eragrostis pectinacea*: panicle, spikelet. From Gould, 1975.

14325). BAJA CALIFORNIA SUR: Many places, from sea level to 1200 m; e.g. Cerro de la Giganta, Mesa San Gerónimo, San Carlos on Bahía Magdalena, Insurgentes, La Paz, Todos Santos, San José del Cabo.

We follow Koch (1974) in treating *Eragrostis diffusa* as a synonym of *E. pectinacea*. Hitchcock (1935a) and Chase (1951) maintained these as separate species, referring most plants of eastern USA to *E. pectinacea* and most plants of western USA and Mexico to *E. diffusa*.

10. *Eragrostis tephrosanthos* Schult., Mant. 2:316. 1824. *E. arida* Hitchc. Tufted annual with culms mostly 12–60 (–80) cm tall. *Sheaths* mostly shorter than internodes, glabrous except for tufts of long hairs on margins at apex. *Blades* thin, soft, glabrous, 1–5 mm broad. *Panicles* ovoid to pyramidal, diffusely branched at maturity, occasionally with few glandular pits below lowermost primary

branch. *Primary inflorescence branches* usually 1 or 2, rarely more, widely or narrowly spreading, bearing secondary and often tertiary branches. *Pedicels* spreading at maturity. *Spikelets* 4–10 mm long, 1.2–2.5 mm broad, with 7–20 florets. *First glume* 0.8–1.4 mm long, the second 0.9–1.7 mm long. *Lemmas* gray-green or stramineous, often tinged with purple, the lower ones 1.2–2.1 mm long. *Paleas* persistent in age. *Caryopsis* pyriform to narrowly ovoid, not grooved, smooth to finely striate or reticulate, dark brown, 0.6–1.1 mm long.

Arizona, New Mexico, and Texas, through Mexico, Central America, and the Antilles, a weedy grass of loose disturbed soils, usually below 1500 m. BAJA CALIFORNIA NORTE: Cañón del Diablo, Sierra San Pedro Mártir (Chambers 642). BAJA CALIFORNIA SUR: Cerro Barranco, Sierra de Guadalupe, 1225 m (Moran 18830); Cerro del Barreno, Sierra de la Giganta, 1300 m (Carter & Moran 5339).

This species often occurs mixed with *E. pectinacea* and is very similar, the only known difference being that shown in the key. Tests have failed to show evidence of crossing (Koch, 1974).

11. *Eragrostis pilosa* (L.) Beauv., Ess. Agrost. 71, 162, 175. 1812. AMORSECO PILOSO, INDIA LOVEGRASS. Annual with slender tufted culms 12–60 cm tall. *Sheaths* shorter than to about equalling internodes, pilose with few long hairs laterally on collar. *Ligule* a short fringe of hairs. *Blades* glabrous, flat to folded, 1–3.5 mm broad. *Panicles* at maturity open, 5–20 cm long, with spreading capillary flexuous branches to 10 cm long, the primary branches commonly verticillate, occasionally paired or fascicled at lowermost or next to lowermost node. *Pedicels* slender, spreading, mostly 4–10 mm long. *Spikelets* 2–10 mm long, 0.9–1.8 mm broad, with 4–17 florets. *Glumes* membranous, unequal, the first usually $\frac{1}{4}$ – $\frac{1}{3}$ as long as and the second ca. as long as lowermost lemma. *Lemmas* thin, pale yellowish green or tinged with purple or red, 1.2–1.6 mm long. *Paleas* ciliate on keels, usually early-deciduous. *Caryopsis* chestnut-brown to yellowish-brown, ellipsoidal, 0.6–0.8 mm long, slightly flattened laterally.

Adventive from the Old World; now occasional on disturbed ground from Maine and Florida to Colorado, Texas, southern California, and Mexico, usually at low to moderate elevations. BAJA CALIFORNIA SUR: Hitchcock (1913:361) reported Palmer, Brandegee, and Purpus collections from Santa Rosalía, Santa Águeda, Mulegé, Vinoramas, Sierra

de la Laguna, El Taste, and San José del Cabo; but no Baja California collections were shown by Koch (1974), and we have seen none.

12. *Eragrostis mexicana* (Hornem.) Link, Hort. Berol. 1:190. 1827. *E. neomexicana* Vasey. *E. limbata* Hitchc. Tufted annual with rather weak culms 15–90 cm tall. *Culms* glandless or with ring of irregular glandular pits below upper nodes. *Sheaths* with or without small glandular pits, mostly shorter than internodes, glabrous except for tufts of hairs on each side of apex and sometimes extending down margins. *Ligule* a ring of short soft hairs. *Blades* glabrous, most commonly 1–5 mm broad but on robust plants occasionally to 10 mm. *Panicle* open, ovate, with erect-spreading or widely spreading primary branches, with or without hairs in their axils, sometimes with glandular pits below lowest nodes; secondary branches usually developed and tertiary branches occasional. *Branches and pedicels* straight or flexuous, widely spreading at maturity. *Spikelets* ovate, with 7–15 florets, 4–7 mm long, 1.4–2.4 mm broad. *First glume* 1.3–2.3 mm long, the second 1.5–2.3 mm long. *Lemmas* gray-green, sometimes tinged with purple, the lower ones 1.7–2.2 mm long. *Paleas* persistent in age. *Caryopsis* angular, short and broad, abruptly narrowed to truncate at both ends, with broad groove on side opposite embryo, 0.6–1.0 mm long, rather coarsely reticulate on surface, chestnut-brown or pale.

Southern California to Texas and Central America, on dry rocky slopes and in dry washes at low to intermediate elevations. BAJA CALIFORNIA SUR: Reported by Swallen (1964:245) from Sierra San Francisquito, but we have seen no specimens.

13. *Eragrostis orcuttiana* Vasey, Contr. U.S. Natl. Herb. 1:269. 1893. Tufted annual with rather weak culms to 90 cm tall. *Culms* glandless or with incomplete ring of irregular glandular pits below upper nodes. *Sheaths* without glands, shorter than internodes, glabrous except for tufts of hairs on each side at apex and occasionally along margins. *Ligule* a ring of short soft hairs. *Blades* glabrous, to 7 mm wide. *Panicle* usually without glands, open, ovate, with erect-spreading to widely divergent primary branches; secondary branches usually present, tertiary branches occasional. *Spikelets* oblong, with 5–12 florets, usually 3–9 mm long and 0.8–1.6 mm wide. *First glume* 0.8–1.5 mm long, the second 1.0–2.0 mm long. *Lemmas* gray-green, the lower 1.4–2.0 mm long. *Paleas* persistent in age. *Caryopsis* angular, short and broad, abruptly narrowed at both

ends, with broad groove on side opposite embryo, 0.7–0.9 mm long, coarsely reticulate, chestnut-brown.

Rocky slopes and dry open canyons, southwestern USA and northwest Mexico. BAJA CALIFORNIA SUR: Cerro Azufre, 1650 m (Moran 18737); La Laguna, Sierra de la Laguna (Jones 27588 [MO], Beetle 2476).

Studies in progress by Dr. Stephen Koch suggest that this may be only a subspecies of the preceding and, furthermore, that it may be the same as *E. virescens* Presl, a South American species.

Wiggins (1980:914) reported *Eragrostis oxylepis* (Torr.) Torr. [*E. secundiflora* ssp. *oxylepis* (Torr.) Koch] from “disturbed soil and roadsides, spottily distributed, San Diego Co., California, and adjacent B.C.”. Otherwise, this grass occurs from eastern Colorado and Kansas to New Mexico, Texas, and northern Mexico. Hitchcock (1912:142) reported it at San Diego from a collection by C. R. Orcutt, and it is listed in several later works (e.g. Munz, 1959); but in the absence of later collections, Munz (1974) dropped it from the flora. We have seen no western collections except for Orcutt’s, and both Dr. Koch and Dr. Harvey have written us they know of none.

41. *Tridens* R. & S.

1. *Tridens muticus* (Torr.) Nash in Small, Fl. Southeast. U.S. 143. 1903. Fig. 38. TRIDENTE ESBELTO, SLIM TRIDENS. Cespitose perennial with stiffly erect culms mostly 20–50 cm tall. *Culm nodes* often bearded with soft hairs. *Ligule* a ciliate membrane 0.5–1 mm long. *Blades* 6–25 mm long, 1–4 mm broad, usually loosely involute or folded on drying. *Panicles* spike-like, tightly contracted, long and narrow, 7–20 (–25) cm long, 3–8 mm thick. *Spikelets* short-pedicel, 8–13 mm long, 5–11-flowered, usually purple-tinged. *Glumes* 1-nerved, unequal, the second slightly shorter than lowermost lemma. *Lemmas* 3.5–5.5 mm long, ciliate on mid-nerve to about middle and on lateral nerves to well above middle, obtuse or slightly notched at apex. *Caryopsis* oblong, finely reticulate, mostly 2–2.3 mm long.

Nevada and southern Utah to California, Texas, and northern Mexico, on dry open clayey and rocky slopes. BAJA CALIFORNIA NORTE: E slope of Sierra Juárez: Cañón Guadalupe, 200 m (Moran 6027); Cañón San Matías, 700 m (Moran 24791).

The two Baja California collections are of the typical variety, *T. muticus* var. *muticus*.



Fig. 38. *Tridens muticus*: plant, spikelet with glumes separate. From Gould, 1951, 1965.

42. *Erioneuron* Nash

1. *Erioneuron pulchellum* (H.B.K.) Tateoka, Amer. J. Bot. 48:572. 1961. *Tridens pulchellus* (H.B.K.) Hitchc. ZACATE BORREGUERO, FALSO TRIDENTE BORREGUERO, FLUFFGRASS. Fig. 39. Tufted perennial, frequently appearing annual, often developing wiry looping stolons. Culms numerous in tuft, 2–15 cm tall. Leaves fascicled at all culm nodes, with broad short sheaths and short tightly involute acic-



Fig. 39. *Erioneuron pulchellum*: plant, spikelet, floret. From Hitchcock, 1935.

ulate blades 1 mm or less broad. Ligule a ciliate membrane ca. 0.5 mm long. Panicle subcapitate, of few sessile or short-pediceled spikelets, exceeded by longer leaves. Spikelets mostly 7–13 mm long, with 6–12 florets. Glumes 1-nerved, subequal, acuminate or short-awned, ca. as long as spikelet. Lemmas mostly 3–5 mm long densely long-ciliate on nerves, cleft to just above middle, with stout awn slightly exceeding apical lobes. Paleas broad, pubescent between nerves and on margins and puberulent on nerves.

Dry rocky or sandy desert flats, washes, and rocky slopes, Utah and Nevada to SE California, Texas, and northern Mexico. BAJA CALIFORNIA NORTE: In the NW in drier parts of Sierra Juárez (Cerro Chichi de la India, 1550 m; Agua Flores, 1130 m; Paso San Matías, 1000 m); S in desert to Sierra San Borja; Islas Ángel de la Guarda and San Lorenzo.

43. *Eleusine* Gaertn.

1. *Eleusine indica* (L.) Gaertn., Fruct. Sem. Pl. 1:8. 1788. ZACATE GUÁCIMA, GOOSEGRASS. Fig. 40. Leafy annual with thick succulent spreading-erect culms mostly 15–70 cm long. Sheaths laterally compressed and sharply keeled, glabrous or hispid on margins. Ligule a lacerate ciliate membrane ca. 1 mm long. Blades elongate, mostly 3–8 mm broad, flat or folded and keeled at base, glabrous or occasionally hispid. Inflorescence with (1–) 2–8 spreading unbranched spicate branches mostly digitate at culm apex but often with 1 or 2 more 1–4 cm below terminal whorl. Inflorescence branches



Fig. 40. *Eleusine indica*: plant, spikelets, floret, seed. From U.S.D.A. Bull. No. 7.

3–15 cm long, with flattened, winged rachis bearing two rows of closely imbricated awnless spikelets. *Spikelets* 3–6 mm long, 3–6-flowered. *Glumes* unequal, acute, the first 1-nerved, the second 3–7-nerved. *Lemmas* glabrous or scaberulous, somewhat laterally compressed and keeled, acute or obtuse. *Grains* 1–2 mm long, plump, rugose, with transverse ridges.

Adventive from the Old World; now a common weed in eastern and southern USA and in Mexico, in moist disturbed soil, especially common along ditches and in cultivated areas. BAJA CALIFORNIA NORTE: Tijuana (*Moran 29448*). BAJA CALIFORNIA SUR: Loreto (*Beetle M-2425*); El Valle Perdido, near La Junta (*Wiggins 15361-B*); San José del Cabo (*Brandege 6*).



Fig. 41. *Dactyloctenium aegyptium*: plant, spikelet, florets, glume. From U.S.D.A. Bull. No. 7.

44. *Dactyloctenium* Willd.

1. *Dactyloctenium aegyptium* (L.) Willd., Enum. Pl. 1029. 1809. PATA DE POLLO, DURBAN CROWFOOT GRASS. Fig. 41. Spreading tufted annual with thick weak culms mostly 10–60 cm tall. *Sheaths* laterally compressed and keeled. *Ligule* a truncate membrane 0.5–1 mm long fringed with hairs ca. as long. *Blades* flat or folded, mostly 2–8 mm broad, usually ciliate and often hispid. *Inflorescence* with 2–6 or more thick digitate spicate branches mostly 1.5–6 cm long, the branch rachis bearing two rows of tightly compressed pectinately spreading spikelets.

the rachis tip projecting beyond terminal spikelet as sharp point 1–7 mm long. *Spikelets* mostly 3–4 mm long, 3–5-flowered, disarticulating between or above glumes. *Glumes* firm, keeled, 1-nerved, subequal, ca. as large as lemmas, the first glume acute or minutely awned, the second usually with short curved awn. *Lemmas* similar to second glume. *Paleas* large, with widely separated nerves. *Grains* plump, reddish brown, coarsely rugose, transversely ridged.

Native to the Old World tropics; now frequent in southern USA, Mexico, Central America, and the Caribbean, a weed of open disturbed soils. BAJA CALIFORNIA NORTE: By highway from mainland Mexico, Presa Rodríguez, SE of Tijuana (Moran 24980). BAJA CALIFORNIA SUR: Collected many places, from sea level to 1000 m (e.g. Mulegé; Punta Conejo; La Paz; N of Todos Santos; San Antonio; Migriño; San José del Cabo; Cabo San Lucas).

45. *Leptochloa* Beauv.

Cespitose annuals and perennials with leafy culms and flat or folded blades. *Ligule* a glabrous or ciliate membrane. *Inflorescence* with few to many spicate branches scattered along main axis. *Spikelets* subsessile or short-pedicel, 2–12-flowered, closely spaced or rather distant on branch rachis. *Glumes* thin, 1-nerved (second occasionally 3-nerved), acute, awnless or mucronate; second usually longer than first. *Lemmas* 3-nerved, frequently puberulent on nerves. *Palea* well developed.

1. Apex of lemma broad and truncate, usually notched and often mucronate; lowermost lemma 3.5–5 mm long; perennial 1. *L. dubia*
1. Apex of lemma broad or narrow, awned or awnless, if broad and truncate then lemma less than 3 mm long; annual.
2. Spikelets 1.5–3 mm long; lemmas awnless 2. *L. filiformis*
2. Spikelets mostly 4–10 mm long.
3. Lemma with awn 0.5–1.5 mm long, body 2–3 mm long; spikelets mostly 4–5 (–6) mm long; inflorescence branches rarely 3 cm long 3. *L. viscida*
3. Lemmas awnless or mucronate, or if with slender awn then lowermost lemma 3–5 mm long; at least some inflorescence branches more than 3 cm long.
4. Spikelets, at least some, 5.5 mm or more long; inflorescence branches 5–35 per panicle.
5. Lemma abruptly narrowed to obtuse, truncate, or slightly notched apex, awnless; nerves often extended into minute mucros; body of lowermost lemma mostly 2–3 mm long 4. *L. uninervia*
5. Lemma tapering to more or less notched apex; awns 0.5–1.0 mm long; body of lowermost lemma usually more than 3 mm long 5. *L. fascicularis*

4. Spikelets 4–5 mm long; inflorescence branches 40–90 per panicle; lemmas broadly acute, apiculate, 2–2.8 mm long 6. *L. panicoides*

1. *Leptochloa dubia* (H.B.K.) Nees, Syll. Pl. Ratisb. 1:4. 1824. ZACATE GIGANTE, GREEN SPRANGLETOP. Perennial to 1 m tall with firm base but without stolons or rhizomes. *Cleistogamous spikelets* usually present both at base of plant and in axils of culm leaves. *Sheaths* glabrous or pilose, the lower ones often laterally compressed and keeled. *Ligule* a ciliate membrane 0.5–1 mm long. *Blades* bluish-green, glabrous or pilose, elongate, 2–6 mm broad. *Inflorescence* with 2–15 unbranched primary branches mostly 4–12 cm long, flexuous, loosely erect or spreading. *Spikelets* mostly 6–10 mm long and 3–7-flowered, mostly subsessile and loosely imbricated on branches. *Glumes* variable in length, acute or acuminate. *Lemmas* often sparsely strigose-pubescent below. *Paleas* large, bowed-out in middle, strigose between nerves.

Oklahoma to Arizona, south through Texas and Mexico, also reported from Florida and Argentina, commonly in grassland associations on well-drained slopes but not infrequent on disturbed soils of ditches, road cuts, and mechanically cleared brushlands. BAJA CALIFORNIA NORTE: Sierra Juárez (San Pedro); Sierra San Pedro Mártir (Arroyo el Picacho, 1625 m; Cañón la Providencia, 580 m); N of Punta Prieta. BAJA CALIFORNIA SUR: San Ignacio; NW of Mulegé; base of Cerro la Giganta; Loreto; W of La Paz; San Pedro; San Antonio; Isla Santa Margarita; Isla San José.

2. *Leptochloa filiformis* (Lam.) Beauv., Ess. Agrost. 71, 161, 166. 1812. DESPARRAMADO ROJO, RED SPRANGLETOP. Fig. 42. Weedy annual with slender weak culms mostly 10–50 (–80) cm tall. *Leaves* usually papillose-hispid or pilose. *Ligule* a lacerate, ciliate membrane 0.5–2 mm long. *Blades* thin, flat, linear, 1–10 mm broad. *Inflorescence* mostly 8–35 cm long, often 1/2–1/3 entire length of culm. *Inflorescence branches* slender, spreading, mostly 2–8 cm long, single or 2–3 at some nodes, the nodes rather widely spaced. *Spikelets* (1–) 2–4-flowered, rather widely spaced on rachis. *Glumes* acute, unequal, the second usually longer than lower lemma. *Lemmas* usually but not always hairy on nerves below middle, obtuse or truncate at apex. *Caryopsis* ovate or obovate, usually 0.7–0.8 mm long.

Frequent throughout southern USA from coast to coast and throughout tropical America, a weed of disturbed soils, in gardens, ditches, and waste places. BAJA CALIFORNIA NORTE: Sierra Juárez (Portezuelo de Jamau, 1300 m); Tijuana; Cárdenas;

Punta Prieta. BAJA CALIFORNIA SUR: San Ignacio; Sierra de la Giganta (Valle de los Encinos, 700 m; Arroyo Peloteado, 575 m; Arroyo Tabor, 250 m); Loreto; La Paz; N of Todos Santos; San José del Cabo.

3. *Leptochloa viscida* (Scribn.) Beal, Grasses N. Am. 2:434. 1896. STICKY SPRANGLETOP. Annual with culms tufted or in rather large clumps, 10–40 (–50) cm tall, usually much-branched and geniculate below, the herbage and inflorescence axis more or less viscid. *Ligule* membranous, glabrous, crose and truncate at apex, 1–3 mm long. *Blades* flat, thin, relatively short and broad, 1.5–4 (–6) mm wide. *Inflorescences* contracted, dense, 2–7 (–10) cm long, terminating main culms and numerous short lateral branches. *Spikelets* 4–6 mm long, 4–7 (–8)-flowered. *Second glume* ca. 2 mm long, the first shorter. *Lemmas* 1.5–3 mm long, usually pubescent on nerves at least below, mostly oblong with rounded, notched apex, the midnerve prolonged into straight short awn.

Eastern New Mexico to southern California and northern Mexico, rather weedy on heavy-soiled bottomlands and along margins of drying swales, in Baja California mostly at low elevations. BAJA CALIFORNIA NORTE: El Arco. BAJA CALIFORNIA SUR: Cuarenta; Sierra de la Giganta; Médano Blanco; Santo Domingo; between Villa Constitución and San Carlos; El Pilar; N of Todos Santos.

4. *Leptochloa uninervia* (Presl) Hitchc. & Chase, Contr. U.S. Natl. Herb. 18:383. 1917. MEXICAN SPRANGLETOP. Annual with coarse succulent culms 50–100 cm tall, usually in rather large clumps. *Lower sheaths* thin, shiny, usually laterally compressed and keeled. *Ligules* hyaline, 2–6 mm long, lacerate but not ciliate, with lateral lobes appearing as sheath auricles. *Blades* firm, elongate, 2–7 mm broad, the uppermost often overtopping inflorescence. *Inflorescence* 10–30 cm long with numerous erect or erect-spreading branches mostly 3–6 cm long. *Spikelets* 4–10 mm long, 6–12-flowered, usually bluish gray at maturity. *Glumes* unequal, usually broad, the second mostly 2–2.5 mm long. *Lemmas* pubescent on nerves below, acute, obtuse, or mucronate at apex, the lateral nerves often projecting as minute lobes or mucro.

Southern USA and through Mexico and the Caribbean to Peru and Argentina, mostly in muddy or wet clayey soils along swales, ponds, and shores of lakes and streams, in Baja California at low elevations. BAJA CALIFORNIA NORTE: Common in muddy ditches in the NW, Tijuana to San Quintín; about



Fig. 42. *Leptochloa filiformis*: a, spikelets on rachis; b, seed; c, leaf sheath and ligule; d, floret; e, plant. From Mason, 1957.

Mexicali. BAJA CALIFORNIA SUR: Mulegé; La Purísima; Sierra de la Giganta; E of Insurgentes; El Pilar; La Paz; San José del Cabo.

5. *Leptochloa fascicularis* (Lam.) A. Gray, Man. 588. 1848. Coarse annual with moderately branched somewhat succulent culms in usually rather large clumps. *Culms* typically 50–100 cm tall but under adverse conditions flowering culms sometimes not over 10–15 cm tall. *Lower leaf sheaths* usually keeled and laterally flattened, the upper rounded. *Ligule* membranous, well-developed, 2–6 mm long, lacerate. *Blades* 2–7 mm broad. *Inflorescence* with 8–35 stiffly erect or erect-spreading branches scattered on upper 6–25 cm of culm axis, the branches mostly 4–12 cm long. *Spikelets* 5–10 cm long, 6–12-flowered, bluish or grayish at maturity. *Glumes* unequal, broad or narrow, 1-nerved, the second glume usually 3–4.2 mm long with short awn at tip. *Lem-*



Fig. 43. *Pereilema crinitum*: panicle, fascicle of spikelets, glumes and floret. From Pohl, 1980.

ma 3-nerved, ovate to oblong, usually pubescent on margins and midnerve below middle, acute or acuminate and often slightly notched at apex, with terminal awn 0.5–1.5 mm long; lateral nerves often projecting as minute mucros; body of lower lemma usually 3–5 mm long.

Widely distributed in USA, to Central and South America, in muddy or wet clayey soils along lakes, swales, and shores of sluggish streams. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:907) from NE Baja California. We have seen no specimens.

6. *Leptochloa panicoides* (Presl) Hitchc., Amer. J. Bot. 21:137. 1934. AMAZON SPRANGLETOP. Tufted annual with stiffly erect rather coarse culms 40–100 cm tall. *Sheaths* glabrous or scabrous, tightly compressed at base. *Blades* 6–12 mm wide, flat, scabrous on margins. *Panicle* 12–30 cm long, mostly 4–8 cm broad, with 40–90 crowded ascending branches 3–6 (–8) cm long. *Spikelets* pediceled, 4–5 mm long, 5–7-flowered. *Glumes* acute or acuminate, the first narrow, 1-nerved, the second broader, 1–3-nerved, 1.6–2 mm long. *Lemmas* 2–2.8 mm long, broadly acute, apiculate, minutely pubescent on margins at base.

Brazil and Mexico; introduced in south-central USA. BAJA CALIFORNIA SUR: Weed in cotton field, Ejido Ley Federal de Aguas No. 1 [N of Villa Insur-

gentes], 40 m, C. Rodriguez J. 1738 (ARIZ fide Charlotte Reeder).

46. *Pereilema* Presl

1. *Pereilema crinitum* Presl, Rel. Haenk. 1:233, pl. 37, fig. a. 1830. Fig. 43. Tufted annual with weak slender culms 10–50 (–70) cm tall. *Sheaths* longer than internodes, with slender ciliate auricles. *Ligule* a minute lacerate membrane. *Blades* thin, elongate, scabrous, 2–4 mm broad. *Panicles* dense, contracted, lobed or interrupted, 3–12 (–15) cm long, 5–7 mm thick excluding the long crinkly lemma awns. *Spikelets* 1-flowered, subsessile, in dense fascicles surrounded by numerous bristles formed from rudimentary or reduced sterile spikelets. *Glumes* equal, 1-nerved, thin, about 1.5 mm long, minutely lobed and with slender awn between lobes. *Lemmas* thin, rounded, scaberulous, slightly longer than glumes, tapering into flexuous capillary awn 1.5–3 cm long.

Mexico to Ecuador, on open or brushy slopes, at moist roadsides, and along shaded cliffs. BAJA CALIFORNIA SUR: Cape region: Sierra San Francisquito (Brandeggee in 1890); La Chuparosa (Brandeggee 63); El Taste (Brandeggee in 1902). Also reported by Swallen (1964:255) from Sierra de la Laguna.

47. *Lycurus* H.B.K.

1. *Lycurus phleoides* H.B.K., Nov. Gen. Sp. 1:142. 1815. ZACATE LOBERO, WOLFTAIL. Fig. 44. Slender tufted perennial with culms 20–60 cm tall. *Leaves* mostly in basal clump. *Sheaths* laterally compressed, much shorter than internodes. *Ligule* a whitish 3-lobed membrane, the acuminate lobes mostly 3–5 mm long. *Blades* grayish-green, 0.5–2 (–3) mm broad, usually with whitish midnerve and margins. *Inflorescence* a slender tightly contracted panicle 3–8 (–12) cm long, 5–8 mm thick. *Spikelets* 1-flowered, short-pediceled, deciduous in pairs with pedicels. *Glumes* ca. 2 mm long, the first 2–3-nerved with 2–3 awns mostly 3–5 mm long, the second similar but 1-nerved and 1-awned. *Lemmas* 3-nerved, 3–4 mm long, with single awn 0.5–3 mm long. *Paleas* awnless, puberulent, as long as lemmas.

Utah and Colorado to Arizona, Texas, and northern Mexico, on plains and rocky slopes. BAJA CALIFORNIA NORTE: Sierra Juárez: Cieneguita, 1450 m (Wiggins 9151A); Sierra San Pedro Mártir: Arroyo el Picacho, 1525 m (Moran 24821), 1700 m (Moran 24849); Santa Rosa, 2050 m (Moran & Thorne 14402). BAJA CALIFORNIA SUR: Cape mountains (Brandeggee in 1899); Sierra de la Laguna (Bran-

degree in 1893; reported by Hitchcock, 1913:305, as *L. phalaroides* H.B.K.)

48. *Muhlenbergia* Schreb. ex Gmel.¹

Perennials or annuals, from low and delicate to tall and robust, tufted or rhizomatous with simple or variously branched, erect or decumbent culms. Leaves flat, folded, or involute, with membranous or firmish ligule. Inflorescence varying from an open and diffuse to elongate and spicate panicle. Spikelets small, 1-flowered (rarely in part 2-flowered), disarticulating above glumes. Glumes minute to as long as or longer than lemma, usually 1-nerved. Lemma firm-membranous, 3-nerved, glabrous or variously pubescent, awnless or mucronate to long awned from acute or bifid apex; callus short, glabrous or usually pubescent. Palea equaling or slightly shorter than lemma, often pubescent between the two nerves. Anthers commonly purple or light yellow. Caryopsis fusiform, closely covered by pericarp, usually reddish brown. Basic chromosome number $x = 10$, rarely $x = 9$.

1. Plants annual or short-lived perennial.
2. Lemma awnless, mucronate, or occasionally with awn as much as 1 mm long.
3. Glumes glabrous.
4. Panicles delicate, very diffuse; pedicels slender, capillary; ligule with conspicuous marginal "auricles"; blades with white cartilaginous margins and midnerve 1. *M. fragilis*
4. Panicles not delicate and diffuse; pedicels short, stoutish; ligule membranous without longer points on margins; blades usually green throughout.
5. Panicles with ascending or spreading branches, often purple; lemma 1–1.2 mm long; anthers 0.2–0.3 mm long 2. *M. wolfii*
5. Panicles with short appressed branches, dark green; lemma 2–2.5 mm long; anthers 0.6–0.7 (–0.9) mm long 3. *M. filiformis*
3. Glumes pubescent at least at apex.
6. Spikelets 1–1.3 (–1.5) mm long; glumes and lemma obtuse or subacute; lemma awnless 4. *M. minutissima*
6. Spikelets (1.3–) 1.5–1.8 mm long; glumes and lemma acute or acuminate; lemma with awn 0.1–0.5 (–1) mm long 5. *M. texana*
2. Lemma conspicuously awned, the awn (3–) 10–20 mm long or longer.
7. Lemma usually conspicuously ciliate on lateral margins; sheath with tuft of long hairs on margins at throat 6. *M. ciliata*
7. Lemma variously pubescent, but without conspicuous cilia on margins; sheath not as above.
8. Glumes much shorter than floret, obtuse; lemma short pubescent on lower $\frac{1}{4}$ to $\frac{1}{3}$, on midnerve and lateral margins; awn 10–20 (–30) mm long; cleistogenes commonly present in axils of lowermost branches of culms.
9. Lemma 2.5–3.5 (–4) mm long; glumes 0.5–1.2 mm long; ligule mostly 1–1.5 (–2) mm



Fig. 44. *Lycurus phleoides*: plant, glumes, floret. From Gould, 1951.

- long; panicle branches ascending or spreading 7. *M. microsperma*
9. Lemma (4.5–) 5–6 mm long; glumes 1–2 mm long; ligule mostly 2–3 mm long; panicle branches closely appressed 8. *M. appressa*
8. Glumes commonly as long as or longer than floret; lemma densely villous on lower $\frac{1}{2}$ – $\frac{2}{3}$; awn 7–8 (–10) mm long; no cleistogenes present 9. *M. brandegei*
1. Plants perennial.
10. Culms robust, mostly 1 m or more tall.
11. Culms profusely branched at upper nodes, with numerous inconspicuous panicles terminating branches; resembling a small bamboo 10. *M. dumosa*
11. Culms unbranched above, with one large panicle terminating culm; plants densely caespitose.
12. Lower sheaths compressed-keeled; blades flat or folded; panicles narrow to broadly pyramidal, 20–40 cm long; ligule 10–30 mm long 11. *M. emersleyi*
12. Lower sheaths rounded; blades soon becoming involute; panicles spicate, 30–60 cm long; ligule short, truncate, (0.5–) 1–3 mm long 12. *M. rigens*
10. Culms slender, mostly less than 1 m tall.
13. Rhizomes present.
14. Lemma awnless or mucronate.
15. Panicles open, diffuse, nearly as wide as long 13. *M. asperifolia*
15. Panicle narrow, contracted, interrupted below.
16. Culms striate and nodulose-roughened; ligule 1.5–2 (–3) mm long 14. *M. richardsonii*
16. Culms smooth, glabrous ("pol-

¹ Contributed by Charlotte G. Reeder.

- ished"); ligule 0.5–1 mm long
 ----- 15. *M. repens*
14. Lemma with awn (5–) 10–20 mm long ----- 16. *M. arsenei*
13. Rhizomes absent; culms caespitose or erect from a wiry, knotty base.
17. Panicles very narrow, spike-like, often interrupted below.
18. Lower sheaths rounded; blades involute, elongate, 15–50 cm long, tapering to long slender point; ligule truncate, firmish, (0.5–) 1–3 mm long; panicles pale gray-green or tawny ----- 12. *M. rigens*
18. Lower sheaths keeled; blades flat or folded (may become involute in drying), mostly to 5 cm long; ligule membranous, 0.5–1 mm long (rarely more); panicles dark green or plumbeous ----- 17. *M. wrightii*
17. Panicles open, narrow, or somewhat contracted but rather loosely flowered, not spicate.
19. Nodes of culm obscure, plants densely caespitose; blades elongate, 15–30 cm long, crowded at base ----- 18. *M. rigida*
19. Nodes of culms several to many, conspicuous; blades mostly 10 (–15) cm long or less.
20. Lemma mucronate or with awn to 1.5 mm long.
21. Panicles open, 4–8 cm wide, usually purple, the branches spreading ----- 19. *M. arizonica*
21. Panicles narrow, mostly not over 1 cm wide, dark green, the short branches appressed ----- 3. *M. filiformis*
20. Lemma with awn (3–) 5–10 mm long or longer.
22. Panicles open, pyramidal or ovoid, with slender capillary pedicels.
23. Glumes broad, narrowed irregularly into short awn points; lemma densely short pilose on callus; anthers orangeish, 1.5–1.6 mm long ----- 20. *M. alamosae*
23. Glumes lanceolate, acute or acuminate; lemma short appressed-pubescent along midnerve and lateral margins on lower $\frac{1}{2}$; anthers purple or becoming pale yellowish, 2–2.2 mm long ----- 21. *M. porteri*
22. Panicles narrow or contracted, usually longer than wide; pedicels short, scabrous.
24. Glumes obtuse, 0.5–1 (–1.2) mm long; cleistogenes usually present in axils of lowermost culm branches ----- 7. *M. microsperma*
24. Glumes acute or acuminate (or awn-tipped) over 1.5 mm long; no cleistogenes present.
25. Lemma scaberulous on nerves on upper part with only a few short appressed hairs on callus ----- 22. *M. pauciflora*
25. Lemma pubescent on lower $\frac{1}{3}$ – $\frac{1}{2}$ ----- 16. *M. arsenei*

1. *Muhlenbergia fragilis* Swallen, Contr. U.S. Natl. Herb. 29:206. 1947. Annual. Culms delicate, erect or spreading, freely branching at lower nodes, 10–35 cm tall, scaberulous to strigulose below nodes. Sheaths often longer than internodes, scaberulous with hyaline margins. Ligule hyaline, erose to lacerate with longer points ("auricles") on margins, 1–3 mm long. Blades flat, 2–6 (–10) cm long, 1–2 mm wide, scabrous below, strigulose above, with prominent white thickened margins and midrib. Panicles fragile, very diffuse, often breaking away at maturity, 9–15 cm long, 4–7 (–10) cm wide, the branches capillary, stiffly spreading or partially reflexed, the branchlets divergent. Spikelets slender, mostly on straight spreading capillary pedicels. Glumes glabrous, 0.5–0.7 mm long, obtuse or subacute. Lemma 1–1.2 mm long, obtuse, glabrous to densely short appressed-pubescent on margins and midnerve (use a good lens). Palea ca. as long as lemma, glabrous to densely short appressed-pubescent between nerves. Anthers 0.3–0.5 mm long, purple. Caryopsis elliptic, slightly flattened dorsally, ca. 0.7–0.8 mm long, reddish brown.

Western Texas to southern Arizona, California, and Mexico, on open moist sandy soil or grassy rocky slopes. BAJA CALIFORNIA NORTE: At 1200–2000 m: Sierra Juárez (NW of Rancho Marcos; El Rincón de Santa Catarina; Portezuelo de Jamaú); Sierra San Pedro Mártir (Arroyo el Picacho; N of Vallecitos).

Muhlenbergia fragilis, often misidentified as *M. minutissima* (Steud.) Swallen, is distinguished by the delicate diffuse panicle 4–7 cm wide, spikelets with glabrous glumes, ligules with long points ("auricles") on either side, and blades with conspicuous white thickened margins and midnerve.

2. *Muhlenbergia wolfii* (Vasey) Rydb., Bull. Torrey Bot. Club 32:600. 1905. *Sporobolus wolfii* Vasey. *S. racemosus* Vasey. Small delicate annual, not infrequently mixed with other annual species. Culms slender, striate, minutely scaberulous below nodes, branching below, erect or spreading, 6–25 cm tall. Sheaths shorter than internodes, glabrous or mi-

minutely scaberulous especially on margins. *Ligule* hyaline, truncate, 0.3–0.5 mm long. *Blades* flat, (0.5–) 1–3 cm long, 1 mm or less wide, becoming involute, glabrous below, puberulent above. *Panicles* ovoid or deltoid, often purple, 2–6 cm long, 1–2.5 cm wide, the ascending or spreading branches mostly simple, few flowered. *Spikelets* small, on short stiff scaberulous appressed pedicels. *Glumes* glabrous, equal or nearly so, obtuse or subacute, 0.5–0.6 (–0.7) mm long. *Lemma* 1–1.2 mm long, rather turgid, minutely short appressed-pubescent on margins and at base of midrib, to almost glabrous, often mottled and darker than glumes. *Palea* ca. as long as lemma. *Anthers* purple, 0.2–0.3 mm long. *Caryopsis* 0.8–1 mm long, elliptical, brownish.

Colorado, New Mexico, and Arizona, to northern Mexico, on open or wooded slopes in thin or disturbed soil. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 2200–2500 m: (Yerba Buena; La Encantada—in both collections mixed with *M. minutissima*). BAJA CALIFORNIA SUR: Cape region: Sierra de la Laguna (Brandegee in 1899); La Chuparosa (Brandegee in 1893, mixed with *M. ciliata* and *M. texana*).

Previously included under *Sporobolus ramulosus* (H.B.K.) Kunth [= *M. ramulosa* (H.B.K.) Swallen], a closely related species of more southern distribution, which has smaller spikelets (0.8–0.9 mm long), glabrous lemmas, and a caryopsis ca. 0.5 mm long (cf. Swallen, 1947).

3. *Muhlenbergia filiformis* (Thurb.) Rydb., Bull. Torrey Bot. Club 32:600. 1905. *Vilfa gracillima* Thurb. in S. Wats., not *Muhlenbergia gracillima* Torr. PULL-UP MUHLY. Annual, or often appearing to be perennial, 5–20 (rarely to 35) cm tall. *Culms* slender, glabrous, loosely tufted, erect or geniculate-spreading, often prostrate and rooting at lower nodes. *Sheaths* glabrous or scaberulous, mostly longer than internodes. *Ligule* hyaline, 1–2 (–3) mm long, rounded, becoming erose or lacerate. *Blades* 1–3 (–5) cm long, 1–1.5 (–2) mm wide, flat or folded near tip, glabrous or scaberulous below, scabrous to pubescent above. *Panicles* plumbeous or dark green, narrow, interrupted, few-flowered, long-exserted, 2–6 (rarely more) cm long, the branches closely appressed. *Spikelets* usually dark green, awnless or mucronate. *Glumes* subequal, 1-nerved, obtuse, often somewhat erose, (0.6–) 0.8–1 mm long. *Lemma* ca. 2 mm long, scaberulous at tip, awnless or mucronate, the callus glabrous. *Palea* about equal to lemma and of similar texture, sca-

berulous at apex. *Anthers* purplish, becoming pale, 0.6–0.7 (–0.9) mm long or longer. *Caryopsis* fusiform, 1–1.2 mm long, ca. 0.3–0.4 mm wide, reddish brown.

South Dakota and British Columbia to Kansas, New Mexico, Arizona, California, and northern Mexico, in open moist meadows and woods and along stream banks. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 1500–2200 m: La Encantada (Moran & Thorne 14350); La Joya, on Arroyo Valladares (Moran 23748); La Grulla (Moran & Thorne 14444); La Vibora, Arroyo La Grulla (Moran 24419). These collections, originally determined as *M. richardsonis* (Trin.) Rydb., a rhizomatous perennial, are larger and coarser than most specimens of *M. filiformis* from the United States. Stout-er plants of *M. filiformis* that may appear perennial and that have ligules 2–2.5 mm long, spikelets over 2.5 mm long, and anthers over 1 mm long, have been segregated as *M. filiformis* var. *fortis* E. H. Kelso.

4. *Muhlenbergia minutissima* (Steud.) Swallen, Contr. U.S. Natl. Herb. 29:207. 1947. Delicate annual, the slender culms erect or spreading, branching at lower nodes, 8–20 (–30) cm tall, scaberulous to strigulose below nodes. *Sheaths* usually shorter than internodes, glabrous or scaberulous. *Ligule* hyaline, toothed or becoming lacerate, 1–2 mm long. *Blades* flat, becoming involute, 1–3.5 (rarely to 10) cm long, ca. 1 mm wide, short pubescent above, scabrous below. *Panicles* open, diffuse, 4–20 (or more) cm long, 1.5–5 cm wide, the branches and pedicels slender, capillary, ascending or spreading. *Spikelets* (1–) 1.1–1.3 (–1.5) mm long. *Glumes* subequal, 0.5–0.8 (–1) mm long, mostly obtuse, pubescent at least near apex. *Lemma* 1–1.3 (–1.5) mm long, obtuse or subacute, very short closely appressed silky pubescent along midnerve and margins on lower $\frac{1}{3}$ to $\frac{1}{2}$ (must use good lens) to almost glabrous with only very few hairs. *Palea* ca. as long as lemma, glabrous or often short appressed silky pubescent between nerves on lower half. *Anthers* purplish, (0.3–) 0.5–0.7 mm long. *Caryopsis* fusiform to elliptic, brownish, (0.6–) 0.8–0.9 mm long.

Montana to Washington, Texas, California, and southern Mexico (Jalisco and Michoacán), in open sandy or rocky areas, along streams, and in open woodlands. BAJA CALIFORNIA NORTE: Sierra Juárez, 1550–1650 m ("Tantillas Mountains" [vicinity of El Progreso], E. Palmer 390 of 1875; Laguna Hanson); Sierra San Pedro Mártir, 2100–2750 m

(Cerro Venado Blanco; Arroyo Copal; Yerba Buena; upper Vallecitos; Corral de Sam; La Encantada; La Grulla).

A widely distributed annual species distinguished by the pubescent glumes and small anthers. *Muhlenbergia texana* Buckl. differs in its acute or acuminate glumes and larger lemmas (mostly 1.6–1.8 mm long) with short awns (0.1–0.5, rarely to 1 mm long). The closely related *M. sinuosa* Swallen, not known from Baja California, has spikelets on long flexuous pedicels, very hairy glumes, and large anthers (1–1.2 mm long). One specimen (Wiggins 16600) from the Sierra San Pedro Mártir tentatively identified as *M. sinuosa* is actually *M. minutissima*.

Early reports of *Sporobolus confusus* (Fourn.) Vasey [= *M. confusa* (Fourn.) Swallen] in Baja California appear to be based on specimens of *M. minutissima*. Swallen (1947) separated various elements formerly placed in *S. confusus* and *S. microsperrmus* (Lag.) Hitchc. Although he distinguished *M. confusa* and *M. minutissima* partly on the basis of lemma pubescence (closely appressed short-pubescent in *M. minutissima* and glabrous in *M. confusa*), he seems to have put the emphasis on spikelet size and on distribution. Collections from the USA and northern Mexico with slightly larger spikelets are determined as *M. minutissima*, those from southern Mexico as *M. confusa*. Wiggins & Demaree 4912 (from La Encantada), with essentially glabrous lemmas 1–1.1 mm long, was determined by A. S. Hitchcock as *S. confusus* but later [no date] was annotated by Swallen as *M. minutissima*.

The report by Correll and Johnston (1970:233) of the closely related *M. eludens* C. Reeder in Baja California is an error (personal communication from M. C. Johnston, July 17, 1977).

5. *Muhlenbergia texana* Buckl., Proc. Acad. Nat. Sci. Philadelphia 1862:91. 1862. Annual. Culms slender, delicate, 10–35 cm tall, branching at base, erect or spreading, strigulose below nodes. Sheaths shorter than internodes, short puberulent. Ligule hyaline, erose or toothed, ca. 1–2 mm long, decurrent. Blades flat or loosely involute, 2–5 cm long, ca. 1–1.5 mm wide, scabrous below, often short-puberulent above. Panicles open, 5–12 cm long, 3–6 cm wide, $\frac{1}{3}$ to $\frac{1}{2}$ length of entire plant, the branches ascending or spreading, the spikelets on somewhat capillary spreading pedicels 2–5 mm long. Spikelets slender, lanceolate, ca. 1.5 mm long. Glumes subequal, lanceolate, acute or acuminate, 0.8–1.5 mm long, sparsely hirsute. Lemma

slender (1.3–) 1.5–1.8 mm long, minutely appressed-pubescent on midrib and margins on lower $\frac{1}{3}$ to $\frac{1}{2}$ (use good lens), minutely bidentate, awned from between minute teeth, the awn (0.1–) 0.2–1 (–1.3) mm long. Palea ca. as long as lemma, minutely appressed-pubescent between nerves on lower part. Anthers 0.4–0.5 mm long.

Rocky canyons and slopes, western Texas to southern Arizona and northern Mexico, easily overlooked and so probably more common than the collections indicate. Not infrequently mixed with other annual species. BAJA CALIFORNIA SUR: Collections in 1893 and 1899 by Brandegee in Cape region; Sierra de la Laguna (with *M. ciliata*); La Chuparosa (Brandegee 58 of 1893, delicate plants of *M. texana*, *M. wolfii*, and *M. ciliata*); Sierra San Francisco.

Closely related to *M. minutissima* (Steud.) Swallen, which is distinguished by awnless lemmas and acute or obtuse glumes. Some specimens of *M. texana* from Baja California were originally determined as *Sporobolus annuus* Vasey [= *M. annua* (Vasey) Swallen], which is known only from a very few collections in Chihuahua and is distinguished by the acuminate hirsute glumes as long as or longer than the lemma.

6. *Muhlenbergia ciliata* (H.B.K.) Kunth, Rév. Gram. 1:63. 1829. Annual. Culms slender, filiform, glabrous, weakly striate, freely branching at lower nodes, erect or lax and spreading, 10–30 cm tall. Sheaths glabrous or sparsely pilose on margins, shorter than internodes. Ligule a ciliate membrane 0.3–0.5 mm long, the sheath margins with tuft of hairs to 1 mm long. Blades slender, flat or loosely involute, mostly less than 1 mm wide, 1–3 cm long (rarely longer), glabrous below, often sparsely pilose above. Panicles numerous, terminal, 4–6 (–10 or more) cm long, the ascending or spreading branches 1–2 cm long, rather distant, densely flowered to base, the spikelets appressed. Glumes narrowly lanceolate, acuminate or short aristate, prominently 1-nerved, glabrous, subequal, 1–1.5 mm long. Lemma narrow, 3-nerved with ridges between nerves which appear as two extra veins, about 2 mm long, prominently ciliate on lateral nerves on upper part, with flexuous awn 5–20 mm long (or in Baja California specimens mostly 1.5–5 mm long); callus minutely short pubescent. Palea a little shorter than lemma, narrow, acuminate. Anthers pale, 0.3–0.4 mm long.

Mexico to Panama and in Ecuador and Peru, on moist rocky slopes, walls, and sides of ditches, and

on moist open ground. BAJA CALIFORNIA SUR: known only from collections by Brandegee in 1893 and 1899 in the Cape region: Sierra de la Laguna: La Chuparosa (mixed with *M. wolffi* and *M. texana*); Sierra San Francisco.

7. *Muhlenbergia microsperma* (DC.) Kunth, Rév. Gram. 1:64. 1829. *M. debilis* (H.B.K.) Kunth. *M. purpurea* Nutt. LITTLESEED MUHLY. Annual or short-lived perennial, 10–60 (–70) cm tall, erect or spreading, much branched below. Culms slender, striate and scaberulous below nodes. Sheaths commonly shorter than internodes, glabrous or scaberulous. Ligule membranous, hyaline, toothed or lacerate, often slightly longer on margins, decurrent, 1–1.5 (–2) mm long. Blades often deciduous, 4–6 (rarely –10) cm long, flat or loosely involute, 1–1.5 mm wide, rarely more, scabrous below, often strigulose above. Panicles numerous, mostly terminal, narrow but loosely flowered, often purple, 5–20 cm long (rarely more in robust plants), 1–3 cm wide, the branches ascending to spreading, appressed when young. Spikelets (2.5–) 3–3.5 (–4) mm long. Glumes obtuse, 1-nerved (rarely 2-nerved in terminal spikelet of branch), subequal, the first 0.5–1 mm long, the second 0.7–1.2 mm long. Lemma narrow, 3-nerved, (2.5–) 3–3.5 (–4) mm long, bidentate, awned from between minute teeth, scabrous on nerves, usually short-pubescent along midnerve and lateral margins on lower 1/3, the callus short-pubescent, the awn 10–20 (–30) mm long, flexuous, usually purple. Palea slightly shorter than lemma, short-pubescent between nerves near base. Anthers purple, of varying lengths within same floret, 0.3–0.9 (–1, rarely more) mm long, not infrequently with one anther sac smaller and/or aborted. Caryopsis narrowly fusiform, 2.2–2.5 mm long, reddish brown. Cleistogamous spikelets usually present, few or numerous, in axils of lowermost branches of culm, developing within a short indurate narrowly conical greatly reduced sheath, devoid of glumes, consisting of lemma with short awn, palea, and more rounded caryopsis.

Nevada, Arizona, and southern California, to Guatemala, and Colombia and Venezuela to Peru, mostly in open ground or rocky places but not infrequently in the protection of thorny shrubs or cacti. This is the commonest species of *Muhlenbergia* in Baja California. BAJA CALIFORNIA: the length of the peninsula at 5–2000 m, but especially common at lower elevations.

Plants vary from small and spreading (in open sites) to those with rather elongate lax sprawling

culms and with lax feathery panicles (among thorny bushes and cacti). Spikelet measurements (including anther length) and vegetative characteristics are extremely variable, depending apparently upon the growing conditions and habitat. Plants with robust leafy somewhat perennial culms and larger spikelets (3.5–4.5 mm long) may grow near “typical” *M. microsperma*: Reeder & Reeder 6767 (“typical”) and 6768 (robust) grow at Juncalito bay, south of Loreto, the robust plants at the base of a steep cliff among rather dense vegetation.

Most specimens from Baja California are easily recognizable; however, several are worthy of note and give some indication of the variability found within the species. J. H. Thomas 8240 (Laguna de Guerrero Negro) consists of unusually small plants with very narrow panicles. Moran 9341 (SD) from Isla Catalina includes a diminutive plant with a narrow panicle along with several quite ordinary specimens. A few collections, all from Baja California Sur, are noteworthy for their unusually long anthers: Moran & Reveal 20199 (Volcán las Tres Vírgenes), Reeder & Reeder 6750 (Buena Vista), Reeder & Reeder 6768 (Juncalito bay), Gould 12136 (El Triunfo), Gould 12160 (SE of San Antonio), and Breedlove & Axelrod 43247 (Sierra de la Laguna). All these collections have some anthers as much as 1.8–2 (or more) mm long. Two specimens have conspicuously hairy lemmas: Beetle M-2627 (Cabo San Lucas) and Moran 7069 (La Palmilla).

The following collections deserve special notice: Moran & Reveal 20199 (Volcán las Tres Vírgenes), Beetle M-2627 (Cabo San Lucas), Gould 12136 (SE of San Antonio), Breedlove & Axelrod 43247 (Sierra de la Laguna), Moran 17463 (Isla San Martín), 9143 (Isla Carmen), and 6548 (Islas los Coronados). In these specimens the ligules are 1–1.5 (–2) mm long and the panicles 1–2 (–3) cm wide, with ascending branches. Although the glumes are mostly 1–1.5 mm long, the lemmas are extremely variable within the same inflorescence, ranging from 3.5 to 4 mm long, with the terminal spikelet of a branch often as much as 4.5–5 mm long. At first glance these collections might seem to be *M. appressa* C. Goodding, a closely related species. However, typical plants of *M. appressa* have very narrow panicles with loosely flowered appressed branches, lemmas 5–6 mm long with glumes 1–2 mm long, and ligules 2–3 mm long. The anther length in *M. appressa* varies within a single spikelet, ranging from 0.4 to 0.9 (rarely more) mm long. Occasionally the two species occur together.

Three robust perennial-like collections (Carter,

Alexander, & Kellogg 2343, 2388, and 2391), from the Sierra de la Laguna of Baja California Sur, which are certainly conspecific, were identified by Swallen in 1948 as *M. parviglumis* Vasey. However, they all seem referable to *M. microsperma* because of the somewhat open panicles with ascending branches and the rather long purple anthers in all three collections and the presence of cleistogenes in the axils of the lower culm branches in 2388. Unfortunately, there is no good base on 2343, and 2391 is well past its prime—which may account for the lack of cleistogenes in these two collections. In *M. parviglumis* the panicles tend to be very narrow and stiffly erect and the scabrous blades longer and more rigidly erect, and the anthers are usually pale yellowish. The Brandegee collections of 1889, 1893, and 1899, from Comondú, Saucito, Sierra San Francisquito, and La Chuparosa, are similar in being rather robust plants with spikelets 3.5–4 mm long, anthers 1.5–1.7 mm long, and only a few cleistogenes in the axils of the lowermost culm branches. All these Brandegee specimens (except that from Saucito—which does not appear) are listed by Hitchcock (1913:294) under *M. microsperma*. Brandegee 22 (February 17, 1889) from Comondú was originally reported by Vasey (in Brandegee, 1889) as *M. calamagrostidea* Kunth [= *M. tenuifolia* (H.B.K.) Kunth, a rather common annual or short-lived perennial of mainland Mexico].

Since plants of this species are annuals (or short-lived perennials) and produce cleistogenes, and since the upper spikelets apparently may develop cleistogamously, minute variations may be reproduced indefinitely with little or no influence from other members of the population. More cytological information is badly needed to understand fully the systematics of this complex. Hybridization between *M. microsperma* and *M. appressa* might possibly explain the unusually large spikelets found in the few collections cited above.

8. *Muhlenbergia appressa* C. Goodding, J. Wash. Acad. Sci. 31:504. 1941. Annual, erect or decumbent. Culms slender, 10–40 cm tall, much branched below, striate, scabrous to hispidulous below nodes. Sheaths shorter than internodes, becoming open and flattened, glabrous or scaberulous. Ligule (1.5–) 2–3 mm long, hyaline, decurrent, rounded, becoming toothed or lacerate. Blades flat or folded, 1–5 (–7) cm long, 1–2 mm wide, scabrous below, puberulent above. Panicles numerous, mostly terminal, 5–20 cm long, very narrow, loosely flowered, the branches closely appressed. Spikelets

slender, on short appressed scabrous pedicels. Glumes about equal, 1–2 mm long, obtuse or subacute, at times somewhat erose, thin, with conspicuous nerve in basal half; in terminal spikelet one glume sometimes 2-nerved. Lemma slender, (4.5–) 5–6 mm long, scaberulous above, densely pubescent at base and along margins on lower ¼ to ½, the awn 10–30 mm long. Palea about same length as lemma, closely appressed-pubescent between nerves on lower ¼ to ½, the nerves projecting as short awn-tips. Anthers often varying within a single floret, 0.3–0.9 mm long. Caryopsis narrowly fusiform, 2–2.5 mm long, brownish. Cleistogamous spikelets in axils of lowermost culm branches similar to those of *M. microsperma*, the single spikelet tightly enclosed in reduced somewhat indurated sheath, consisting of lemma ca. 2.5–3.5 mm long, with awn 1.5–3.5 mm long, a palea, anther or anthers 0.2–0.3 mm long, and well-developed pale pinkish caryopsis ca. 1.6–2 mm long and 0.5 mm wide.

Southern Arizona to Baja California, in canyons and on rocky slopes. BAJA CALIFORNIA NORTE: Sierra Juárez, 1350–1750 m (El Progreso; Santa Catarina; Portezuelo de Jamau); Tinajas de Moraga, Cerro Matomí, 1150 m; Sierra San Borja, 1200 m. BAJA CALIFORNIA SUR: Rancho la Laguna, Sierra San Francisco, 1340 m; Cerro Azufre, 1450 m (Moran 18758, mixed with *M. microsperma*); Sierra de las Palmas, south of Santa Rosalia.

Closely related to *M. microsperma*, which is distinguished by its open panicles with ascending or spreading branches, shorter ligules (1–1.5 mm long), shorter glumes (0.5–1.2 mm long), and shorter lemmas (2.5) 3–3.5 (–4) mm long.

9. *Muhlenbergia brandegei* C. Reeder, Madroño 13:248. 1956. Fig. 45. Annual. Culms erect or ascending, 15–25 cm tall, striate and scabrous on nerves below nodes, otherwise mostly glabrous, branching from lower nodes. Sheaths glabrous to minutely scabrous, mostly shorter than internodes, the margins scarious. Ligule membranous, erose, ca. 0.7–1.0 mm long, the pointed margins to 1.5 mm. Blades flat or with apex somewhat involute, 3–4 (–7) cm long, 1–1.5 (–2) mm wide, scaberulous below, scabrous to sparsely short-pubescent above. Panicles contracted, pale greenish, 3–10 cm long, 0.5–0.7 cm wide, the branches appressed, densely flowered to base, the pedicels appressed, 1–3 mm long. Spikelets ca. 3–4.5 mm long; glumes subequal, usually longer than lemma, with prominent scabrous nerve, otherwise glabrous. Lemma 3–3.5

(-4) mm long, densely pubescent with longer white hairs near apex and shorter at base, the apex acuminate, bifid, with awn (5-) 7-8 mm long from between teeth. *Palea* about as long as lemma, conspicuously pubescent between nerves. *Anthers* purplish, ca. 1-1.5 (-2) mm long. *Caryopsis* fusiform, ca. 1.4-1.8 mm long, 0.5 mm wide, dark brownish.

Endemic to Baja California. BAJA CALIFORNIA SUR: Isla Santa Margarita (Brandegee 16 of 1889, type); rocky slope near beach at 5 m, Isla Catalina (Moran 9361); arroyo opening onto small beach, west shore of Isla Partida [Espíritu Santo] (Wiggins, Carter, & Ernst 434A). The Isla Partida collection is not typical, having short glumes (1.5-2 mm long), a lemma 2.5-3 mm long with awn 8-10 mm long, and anthers only 0.4-0.5 mm long.

Hitchcock (1913:294) identified the Brandegee collection as *M. biloba* Hitchc., a related and rarely collected species confined to the mountains of Chihuahua and Durango.

10. *Muhlenbergia dumosa* Scribn. ex Vasey, Contr. U.S. Natl. Herb. 3:71. 1892. *M. dumosa* var. *minor* Scribn. ex Beal. Perennial from short thickened rhizome; resembling a small bamboo. *Culms* somewhat woody below, erect or becoming lax and sprawling, 1-3 m tall, glabrous, freely branching from upper nodes. *Lower sheaths* glabrous, becoming loose, flattened, papery, remaining after fall of blades. *Ligule* short, truncate, ca. 0.5 mm long. *Prophylls* prominent, appearing as long slender scabrous or minutely ciliate appendages. *Blades* numerous, narrow, lax, flat soon becoming involute, glabrous or minutely scaberulous, the longest 6-8 (-12) cm long, ca. 1-1.5 mm wide, often extending into narrow setaceous point. *Panicles* inconspicuous, numerous, terminating branches, 1-3 cm long, narrow, lax. *Spikelets* subsessile or on short pedicels, green or purplish, 2.5-3 mm long. *Glumes* subequal, subobtusate, acute or awn-tipped, prominently 1-nerved, 1-2 mm long (including awn tips). *Lemma* pale with prominent green nerves, narrow, 2.5-3 mm long, pubescent on lower 1/4-1/3 along midnerve and on lower 1/3-1/2 on lateral margins, with slender usually slightly bent or curved awn 2-7 mm long from between teeth of minutely bifid apex. *Palea* acute or acuminate, slightly shorter than lemma, pubescent on lower 1/2 between nerves. *Anthers* 0.8-0.9 mm long.

Southern Arizona to Jalisco, Mexico, in rocky canyons and on steep slopes where protected from most grazing animals. Flowering early in spring.

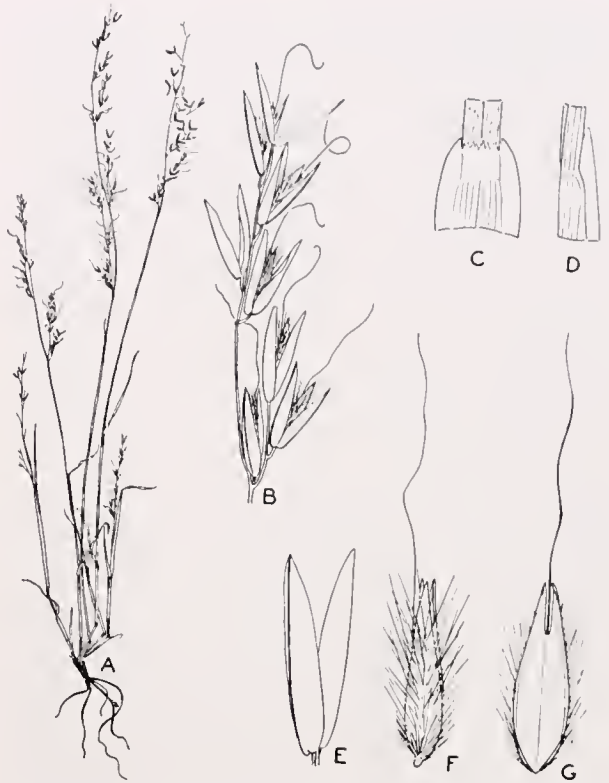


Fig. 45. *Muhlenbergia brandegei*: A, plant; B, panicle branch with spikelets; C, D, ligule; E, glumes; F, floret; G, flattened lemma, adaxial view. From the original publication of Reeder.

BAJA CALIFORNIA SUR: On broken terrain of volcanic mountain top, La Champagna, Sierra de las Palmas, S of Santa Rosalía, 1300-1500 m, 27-29 Apr. 1952 (Gentry & Fox 11798, US).

11. *Muhlenbergia emersleyi* Vasey, Contr. U.S. Natl. Herb. 3:66. 1892. *M. vaseyana* Scribn. BULL. GRASS. Robust perennial, forming dense clumps. *Culms* coarse, erect, 80-100 (-150) cm tall, glabrous or minutely scaberulous below the 3 or 4 nodes. *Sheaths* commonly compressed-keeled, glabrous or scabrous. *Ligule* 10-25 mm long, tapering into long acuminate hyaline lacerations, firmer below on margins; or on innovations ligules long, narrow, membranous throughout. *Blades* flat or folded, scabrous below, more or less glabrous above, elongate, 20-50 cm long, (1-) 2-4 (-6) mm wide, the margins coarsely scabrous. *Panicles* forming purplish or tawny narrow to broadly pyramidal plumes, 20-40 cm long, (3-) 4-7 cm wide, the branches ascending and rather densely flowered on outer part, naked below. *Spikelets* on glabrous or scabrous pedicels. *Glumes* thin, only very faintly 1-nerved, acute to obtuse, subequal, as long as or

slightly longer than floret, 2.5–3.5 (–4) mm long, scaberulous to scabrous. *Lemma* 3-nerved, 2.5–3 mm long, pubescent along midnerve and lateral margins on lower $\frac{1}{2}$ – $\frac{2}{3}$, very slightly bifid at apex, awnless or more commonly with midnerve extending into flexuous usually purple awn as much as 10–20 mm long, the awns early deciduous or a few persisting. *Palea* about as long as lemma, with few to many short appressed hairs between nerves on lower $\frac{1}{3}$ – $\frac{1}{2}$. *Anthems* 1.5–1.6 mm long, purplish. *Caryopsis* narrowly fusiform, red-brown, ca. 1.5 mm long.

Texas to Arizona and southern Mexico, on rocky or wooded slopes. In Baja California at 1500–2000 m. BAJA CALIFORNIA NORTE: Sierra Juárez (N of Laguna Hanson, *Moran 16639*); Sierra San Pedro Mártir (Arroyo el Picacho SE of Rancho Nuevo, *Moran 24847*; Santa Rosa, *Moran & Thorne 14404*). The lemmas in *Moran 16639* and *24847* are mostly awnless, with occasional awns 2.5–5 mm long. Some lemmas of *Moran & Thorne 14404* have awns to 15 mm. BAJA CALIFORNIA SUR: Sierra de la Giganta (Cerro la Giganta); Sierra de la Laguna (S of Pico la Aguja; El Picacho de la Laguna; several collections without precise locality by Brandegee in 1890 and 1899); Sierra San Francisquito (*Brandegee in 1890 and 1899*); Sierra el Taste (El Taste and El Taste ridge).

The collections of T. S. Brandegee in 1890, 1893, and 1899 were variously determined and reported as *M. grandis* Vasey and *M. distichophylla* Kunth. These species, both members of *Muhlenbergia* Sect. *Epicampes*, are confined to mainland Mexico (cf. Soderstrom, 1967).

Muhlenbergia emersleyi, an extremely variable member of Sect. *Epicampes*, is distinguished by the robust densely cespitose habit and the compressed-keeled sheaths. The spikelets have thin, glabrous or scaberulous glumes with inconspicuous nerves. The glumes are equal to or slightly longer than the floret. The lemmas, which are pubescent on midnerve and margins on the lower half, may be awned or awnless.

12. *Muhlenbergia rigens* (Benth.) Hitchc., J. Wash. Acad. Sci. 23:453. 1933. *Epicampes rigens* Benth. DEER GRASS. Coarse cespitose perennial with stiff erect mostly glabrous culms 60–100 cm or more tall. *Sheaths* rounded, glabrous or scaberulous, often overlapping and crowded, not infrequently purplish at base, becoming flat and somewhat papery in age. *Blades* elongate, (10–) 15–50 cm long, 1–4 mm wide, stiff, becoming involute, tapering into long

slender point, mostly glabrous below, scabrous between prominent ridges above. *Ligule* somewhat firm, truncate or with rounded auricles, (0.5–) 1–3 mm long, often somewhat ciliate along top, glabrous or scaberulous on margins. *Panicles* elongate, narrow, spikelike, grayish green or tawny, mostly 30–60 cm long, often interrupted at base, the lower branches 1–4 (–7 or more) cm long, floriferous to base. *Spikelets* 2.5–3.5 mm long. *Glumes* subequal, commonly shorter than lemma, acute or obtuse, scabrous or scaberulous, 2–3 mm long. *Lemma* 2.5–3.5 mm long, acute to obtuse, often mucronate with mucro to 1 mm long, scabrous to scaberulous above with few short appressed hairs at base along midnerve and margins. *Palea* about as long as lemma, scabrous or glabrous between nerves. *Anthems* 1.5–1.7 (–1.8 or more) mm long, yellowish, often becoming purplish in maturity. *Caryopsis* fusiform, ca. 2 mm long.

Texas to southern California and northern Mexico, in gravelly or sandy canyon bottoms, often in moist soil along small streams; in Baja California at 50–2500 m. BAJA CALIFORNIA NORTE: “Tia Juana” (*Susan Stokes in 1895*); Guatay [Jatay] Grade; Cañada las Palmas, S side Valle las Palmas; Sierra Juárez (Rancho Santa Isabel; Cañada Rincón); Sierra San Pedro Mártir (El Picacho; Vallecitos meadow; Yerba Buena; La Corona; La Encantada; Los Encinos; Cañón Teledo; La Vibora); Cañada el Islay, NW of San Telmo; head of Arroyo Matomí, Cañón de Matomí. BAJA CALIFORNIA SUR: Near San Javier (*Beetle M-2454*); Sierra San Francisquito (*Brandegee in 1899*).

As treated here, *M. rigens* includes *M. mundula* and *M. marshii*, both named by I. M. Johnston in 1943. Dr. T. R. Soderstrom (1967) in studying this complex found no satisfactory characters to distinguish these “species”.

13. *Muhlenbergia asperifolia* (Nees & Mey.) Parodi, Univ. Nac. Buenos Aires Rev. Agron. 6:117. 1928. *Sporobolus asperifolius* (Nees & Mey.) Nees. SCRATCHGRASS. Low spreading perennial with slender, shiny, scaly rhizomes. *Culms* glabrous (“polished”), erect or spreading and decumbent, compressed, 10–50 (–60) cm tall. *Sheaths* more or less compressed, usually overlapping, glabrous, often minutely pubescent on margins. *Ligule* short, truncate, membranous, sometimes erose and/or short-ciliate, 0.2–0.5 mm long. *Blades* flat or folded, commonly 2–6 cm long, 1–1.5 (–2) mm wide, scabrous (to strigulose) above, more or less glabrous below. *Panicles* diffuse, 6–15 (–17) cm long, 6–14 cm wide,

often breaking away at maturity, the slender branches widely spreading, few flowered. *Spikelets* usually purple, occasionally 2-flowered, on long capillary scabrous pedicels. *Glumes* ca. equal, (0.6–) 1–1.5 mm long, acute to obtuse. *Lemma* 1.5–1.7 (–2) mm long, glabrous, awnless or with mucro 0.1–0.2 mm long. *Palea* equal to lemma or a little longer. *Anthems* purplish, ca. 1–1.2 mm long. *Caryopsis* elliptical, 0.8–0.9 mm long, 0.4–0.5 mm wide.

Alberta and British Columbia to Illinois, Texas, California, and Mexico, and in southern South America; in open areas, often in alkaline soil, and along irrigation ditches and stream banks. In Baja California at 1100–2100 m. BAJA CALIFORNIA NORTE: Sierra Juárez (road from Ojos Negros to Rancho Neji; Laguna Hanson; Santa Catarina); Sierra San Pedro Mártir (Potrero de los Encinos; La Encantada; La Grulla; Santa Rosa).

An easily recognized species, with scaly creeping rhizomes, open diffuse usually purple panicles, and awnless spikelets.

14. *Muhlenbergia richardsonis* (Trin.) Rydb., Bull. Torrey Bot. Club 32:600. 1905. *M. squarrosa* (Trin.) Rydb. MAT MUHLY. Perennial from hard knotty base, with short scaly rhizomes, often somewhat mat-forming. *Culms* erect, spreading, or somewhat decumbent, branching from lower nodes, 5–60 cm tall, striate and minutely nodulose-roughened below nodes. *Sheaths* mostly shorter than internodes, striate, glabrous. *Ligule* membranous, 1–2 (–3) mm long, erose or shallowly toothed. *Blades* short, flat becoming involute, 1–3 (–5) cm long (rarely longer, especially on sterile shoots), 1–1.5 (–2) mm wide, strigulose above, glabrous or scaberulous below. *Panicles* narrow, 2–10 cm long, interrupted below, the branches short, appressed, greenish or tawny. *Spikelets* on short pedicels, somewhat crowded on short appressed branches. *Glumes* subequal, obtuse or subacute, shorter than lemma, glabrous, 1-nerved, 1–1.5 mm long. *Lemma* acute, acuminate, or mucronate, scabrous near apex, 2.5–3 mm long, the callus glabrous. *Palea* a little shorter than lemma, scaberulous at apex. *Anthems* 1.2–1.5 mm long. *Caryopsis* fusiform, ca. 1.2 mm long, brownish.

New Brunswick and Maine to Alberta and New Mexico, and west to the higher elevations of eastern Washington to Baja California, in open often alkaline soil and in sandy arroyo bottoms. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, ca. 2200 m; in small arroyo, Tasajera trail N of Rancho Viejo (Moran 24496); on margins of meadow and adjacent

slopes, La Encantada (Wiggins & Demaree 4932); gravelly arroyo bank, Los Llanitos (Moran 28016).

Similar to *Muhlenbergia repens* (Presl) Hitchc., which has glabrous ("polished") culms, more spreading habit, and shorter ligules (0.5–0.7 (–1) mm long). "There are two intergrading forms of this species; one with rather stout decumbent or somewhat spreading culms (*M. squarrosa* (Trin.) Rydb.), the other with slender erect culms (*M. richardsonis* (Trin.) Rydb.)" (Chase, 1951:382).

As far as can be ascertained, the 1899 Brandegee collection from Sierra de la Laguna reported by Hitchcock (1913:295) as *Muhlenbergia squarrosa* is the same as that labeled *Sporobolus utilis* (Torr.) Scribn. at US. This is *M. repens* (Presl) Hitchc.

15. *Muhlenbergia repens* (Presl) Hitchc. in Jeps., Fl. Calif. 1:111. 1912. CREEPING MUHLY. Low perennial with scaly rhizomes. *Culms* glabrous ("polished"), erect or somewhat spreading, decumbent, usually 5–20 cm long but sometimes longer. *Sheaths* mostly glabrous, shorter than internodes. *Ligule* membranous, decurrent, short truncate, often becoming split, 0.5–1 mm long. *Blades* short, flat or soon becoming involute, arcuate-spreading, glabrous below, scabrous to strigulose above, ca. 1 mm wide, 1–3 (–5) cm long, longer on sterile shoots. *Panicles* narrow, interrupted below, loosely few flowered, usually tawny or pale greenish, 1–4 cm long. *Spikelets* on short pedicels, appressed or ascending on short branches. *Glumes* obtuse or acute, glabrous or scaberulous, shorter than floret, 1-nerved, 1.5–2 mm long. *Lemma* 2.5–3 (–3.5) mm long, scaberulous above, acute or tapering to short mucro (0.1–0.3 mm long). *Palea* of same length and texture as lemma. *Anthems* 1–1.5 mm long. *Caryopsis* 1.3–1.5 mm long.

Texas to Arizona, SE California, and Mexico, on open sandy ground and in canyon bottoms. Rare in Baja California, at 2000–2500 m. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir: local in dry sandy soil in meadow. Rancho Viejo, 2100 m (Moran 19176). BAJA CALIFORNIA SUR: Sierra de la Laguna, Brandegee 33 of 1899 [as *Sporobolus utilis* (Torr.) Scribn.]; Sierra de la Laguna, S of Pico la Aguja, Breedlove & Axelrod 43399.

This species is distinguished by its scaly rhizomes, glabrous "polished" culms, and mostly glabrous awnless or mucronate lemmas 2.5–3 mm long. Related to *M. utilis* (Torr.) Hitchc., which has smaller spikelets (1.5–2 mm long) and finer widely spreading blades; *M. utilis* is unknown for Baja California.

16. *Muhlenbergia arsenei* Hitchc., Proc. Biol. Soc. Wash. 41:161. 1928. Perennial from short knotty base, with short rhizomes. Plants with loosely tufted appearance from branching at lowermost nodes. *Culms* 10–45 (–50) cm tall, erect or decumbent-spreading, strigulose or strigose below nodes. *Sheaths* shorter than internodes, strigulose especially near top. *Ligule* membranous, 1–1.5 (–2) mm long, erose or toothed, strigulose on outer margins, which may be slightly extended. *Blades* mostly basal, the upper ascending or spreading, flat becoming involute, 1–5 (–6) cm long, ca. 1–1.5 (–2) mm wide, hispid or short pubescent above, scabrous or strigulose below. *Panicles* narrow, loosely flowered, becoming long exserted, 5–11 (–13) cm long, the distant branches appressed, but ascending or spreading during anthesis, the lower as much as 3–4 cm long. *Spikelets* on short strigulose pedicels, mostly closely appressed to branchlets. *Glumes* subequal, acuminate or aristate, a little shorter than to as long as floret, scabrous on upper part of conspicuous green nerve, (2.5–) 3–4 mm long. *Lemma* (3.5–) 4–5 mm long, pubescent along midnerve near base and up lateral margins for $\frac{1}{3}$ – $\frac{1}{2}$ length, tapering into flexuous purple awn (5–) 10–20 mm long. *Palea* ca. as long as lemma, pubescent on lower $\frac{1}{2}$ between nerves. *Anthers* purplish, (1.3–) 1.5–1.8 mm long. *Stigmas* plumose, purple.

Northern New Mexico and SE Utah to southern California (Clarke Mountains) and northern Baja California, in crevices among rocks of arid slopes and arroyos. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 1900–2500 m: upper Vallecitos meadow (Moran 23729); Campo de las Viejas, N of La Encantada (Wiggins 16652); La Encantada (Wiggins & Demaree 4946); La Vibora, Arroyo La Grulla (Moran 24448); Santa Rosa (Moran & Thorne 14408).

Although Wiggins & Demaree 4946 was determined by A. S. Hitchcock as the closely related *M. polycaulis* Scribn., it seems better referred to *M. arsenei*; *M. polycaulis* has smaller spikelets (2.2–3.5 mm long), and the anthers are orangeish. The distribution of *M. arsenei* is puzzling, and there is a possibility that with more field study, along with cytological information, the Baja California plants may prove to represent an undescribed species.

17. *Muhlenbergia wrightii* Vasey in Coulter, Man. Bot. Rocky Mt. 409. 1885. SPIKE MUHLY. Perennial. *Culms* usually densely tufted from hard knotty base, erect or somewhat spreading, (15–) 20–60 cm tall, striate and strigulose below the usually 3–5

nodes. *Sheaths* compressed-keeled, glabrous or minutely scaberulous, shorter than internodes. *Ligule* a truncate ciliate membrane 0.5–1 (–3) mm long. *Blades* flat or folded, erect or ascending, with prominent midrib and margins, as much as 5 (–6) cm long, 1–3 mm wide, glabrous below, scaberulous to strigulose above, often with long-attenuate tip. *Panicles* dark green or plumbeous, erect, stiff, densely flowered, narrow spicate, interrupted below, 5–10 (–15) cm long. *Spikelets* crowded on branches, dark green. *Glumes* about equal, 0.5–1 mm long, acute or obtuse, abruptly narrowed into short awn 0.5–0.8 mm long. *Lemma* 2.5–3 mm long, with closely appressed short hairs along midnerve and margins on lower $\frac{1}{4}$ – $\frac{1}{2}$, acuminate or tapering into short awn 0.3–0.5 (–1) mm long. *Palea* about as long as lemma, with closely appressed short hairs between nerves on lower half, the apex with two short teeth. *Anthers* greenish, ca. 1 mm long.

Colorado and Utah to Oklahoma, New Mexico, Arizona, and northern Baja California, in meadows and woodlands. Rare in Baja California. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir: flat in Jeffrey pine forest, Yerba Buena, 2500 m (Moran & Thorne 14236).

Muhlenbergia wrightii is distinguished by its relatively low stature, dark green spicate interrupted inflorescences, compressed-keeled sheaths, and glumes which are broad below but taper abruptly to an awn point.

18. *Muhlenbergia rigida* (H.B.K.) Kunth, Rév. Gram. 1:63. 1829. *M. laxiflora* Scribn., Zoe 4:389. 1894. PURPLE MUHLY. Perennial. *Culms* densely cespitose, stiffly erect, 50–100 cm tall, glabrous or minutely scaberulous below the obscure nodes. *Sheaths* often persistent, rounded, mostly glabrous. *Ligule* firmer below, hyaline toward apex, the lower ones truncate or obtuse, 1–4 mm long, the upper longer, the firm edges appearing as scaberulous extensions of sheath margins. *Blades* elongate, 15–30 cm long, 1–2 mm wide, flat soon becoming involute, glabrous or usually minutely whitish papillose-roughened below, strongly ribbed above, scabrous. *Panicles* usually purple, loosely flowered, from narrow to somewhat open and lax, 10–30 cm long, the slender branches ascending or spreading; lower branches to 8 cm long. *Spikelets* on appressed or spreading scabrous capillary pedicels 3–10 mm long. *Glumes* about equal, short, obtuse or acute, 1–1.5 (–1.7) mm long, 1-nerved, glabrous. *Lemma* 4–4.5 (–5) mm long, slender, with a few short appressed hairs on callus, scaberulous

above, tapering into slender flexuous awn (3–) 5–15 (–20) mm long. *Palea* about as long as lemma, scaberulous above. *Anthers* purple, ca. (1.5–) 1.8–2 mm long.

Texas to Arizona, Mexico, and South America, on rocky hillsides and in canyons. BAJA CALIFORNIA SUR: Cape region: Valley of La Laguna, S of Pico la Aguja, Sierra de la Laguna, ca. 2000 m (*Breedlove & Axelrod* 43389); La Chuperosa (*Brandegee* 74, 17 October 1893, type of *M. laxiflora* Scribn.).

The Brandegee collection is noteworthy for its narrow panicle and short-awned (–3 mm long) lemmas. However, this appears to be only one of the many “forms” of the polymorphic species. In the Breedlove & Axelrod collection the panicle is rather narrow but loosely flowered, the lemmas have awns 10–12 mm long, and the glumes are acute to pointed. Plants of this species have panicles from open and diffuse to narrow and contracted but loosely flowered. The midnerve of the lemma may extend into an awn, which may be long and flexuous or short and straight, or the lemma may be awnless. Glumes may be obtuse or acute at the apex. Thus far, no sharp discontinuities have been found to justify segregating these variants as formal taxa.

19. *Muhlenbergia arizonica* Scribn., Bull. Torrey Bot. Club 15:8. 1888. Low loosely tufted perennial. *Culms* slender, erect or decumbent at base, unbranched above but with short lateral offshoots in basal tuft, 15–40 cm tall, scabrous to strigulose below nodes. *Sheaths*, especially lower, keeled, glabrous or scaberulous. *Ligule* decurrent, hyaline, rounded or becoming erose or toothed, 1–2 mm long. *Blades* short, flat or folded, mostly less than 5 cm long, 1–2 mm wide, glabrous or scabrous below, often scabrous-pubescent above, with conspicuous white cartilaginous margins and midnerve. *Panicles* open, becoming long-exserted, purple, 5–15 cm long, 4–8 cm wide. *Spikelets* on long slender capillary pedicels. *Glumes* about equal, obtuse or subacute, glabrous, ca. 1 mm long. *Lemma* slender, prominently 3-nerved, slightly bifid at apex, 2.5–3 mm long, minutely short appressed-pubescent on lower ½ along midnerve and lateral margins. *Awn* slender, 0.5–1.5 mm long. *Palea* about as long as lemma, glabrous. *Anthers* purple, 1.5–1.6 mm long.

Southern Arizona to Durango, Mexico, on rocky hillsides. BAJA CALIFORNIA SUR: La Champagna, Sierra de las Palmas, S of Santa Rosalía, between 1300 and 1500 m (*Gentry & Fox* 11763).

20. *Muhlenbergia alamosae* Vasey, Bot. Gaz. 16:146. 1891. Perennial. *Culms* cespitose, erect, wiry, with many exposed nodes, striate, glabrous, 30–60 cm tall. *Sheaths* shorter than internodes, glabrous or scaberulous, sometimes flattened and divergent. *Ligule* 1–2 (–4) mm long, firm-membranous, scaberulous outside, often left exposed after disarticulation of blades. *Blades* flat, lax, spreading, early deciduous, 5–15 cm long, 1–2 (–3) mm wide, scaberulous on both surfaces. *Panicles* open, loosely flowered, ovate or pyramidal, (4–) 6–12 cm long, 2–6 cm wide, commonly purple, the axis scaberulous, the branches somewhat divergent-spreading. *Spikelets* on pedicels usually shorter than lemma. *Glumes* subequal, ca. 1 mm long, acute, erose, or dentate at apex, with awn tip 0.5–1 mm long. *Lemma* (2–) 2.5–3 mm long, densely short pilose on callus, with slender flexuous awn 5–10 (–15) mm long. *Palea* ca. as long as lemma, short-pilose on lower half between nerves. *Anthers* orangeish, 1.5–1.6 mm long.

Mexico, in Sonora to Morelos and southernmost Baja California, on mossy cliffs and in moist ravines, flowering early in spring. BAJA CALIFORNIA SUR: Cape region: Sierra de la Laguna, March 26, 1892 (*Brandegee* 79). This specimen was originally identified as *M. calamagrostidea* Kunth [= *M. tenuifolia* (H.B.K.) Kunth], an annual or short-lived perennial common in mainland Mexico but so far unknown in Baja California.

21. *Muhlenbergia porteri* Scribn. ex Beal, Grasses N. Amer. 2:259. 1896. *M. texana* Thurb. ex Porter & Coulter, not *M. texana* Buckl. BUSH MUHLY. Perennial. *Culms* numerous, somewhat cespitose from knotty persistent wiry base, widely spreading or clambering among thorny shrubs, striate, scaberulous below nodes, freely branching from the various nodes, 30–100 (or more) cm long. *Sheaths* shorter than internodes, glabrous, often diverging from culm revealing conspicuous prophyllum. *Ligule* decurrent, 1–2 (–4) mm long, hyaline, toothed or lacerate, with longer points (“auricles”) on margins. *Blades* early deciduous, lax, flat or folded, 2–6 (–8) cm long, ca. 1–1.5 mm wide, usually scabrous above and glabrous below. *Panicles* numerous, open, loosely flowered, often purple, 5–10 (rarely more) cm long, about as wide, the branches and branchlets delicate, fragile, widely spreading, bearing few spikelets near tips. *Spikelets* ca. 3–4 (–4.5) mm long, on long slender capillary pedicels. *Glumes* subequal, acute or acuminate, glabrous except scabrous on prominent nerve, 2–2.5 (–3) mm

long. *Lemma* 3–4 (–4.5) mm long, acuminate, short appressed-pubescent on both sides of midnerve and along margins on lower $\frac{1}{2}$ – $\frac{3}{4}$, with slender awn (3–) 4–8 (–10) mm long. *Palea* ca. as long as lemma, glabrous or puberulent between nerves. *Anthers* purple (or pale yellowish in aging), ca. 2–2.2 mm long.

Colorado and Nevada to Texas, California, and northern Mexico, on dry mesas and rocky slopes—especially in the protection of thorny shrubs, for it is highly palatable to livestock. Formerly much more abundant. BAJA CALIFORNIA NORTE: Vicinity of Paso San Matías, 700–1200 m (Moran 24687, 24772, 24795, 24820).

The report by Wiggins (1969:322) of *M. porteri* in the Desierto Vizcaíno is in error (letter from Dr. Ira Wiggins, June 22, 1975).

22. *Muhlenbergia pauciflora* Buckl., Proc. Acad. Nat. Sci. Philadelphia 1862:91. 1862. NEW-MEXICAN MUHLY. Perennial, loosely tufted, erect or ascending from knotty, wiry base, branching and rarely rooting at lower nodes. *Culms* 30–60 (–70) cm tall, striate, often glaucous below the several to many nodes. *Sheaths* rounded, becoming flat and spreading at maturity, glabrous or minutely scaberulous, mostly shorter than internodes. *Ligule* membranous, 0.5–1 mm long, erose or toothed, the margins extended to form “auricles” 1–2 (–3) mm long. *Blades* slender, early deciduous, ca. 1 mm wide, 5–7 (–12) cm long, flat becoming involute, glabrous below, scaberulous above. *Panicles* narrow, contracted, interrupted, 5–15 (rarely less) cm long, often purple, the short appressed or ascending branches rather densely flowered to base. *Spikelets* crowded, on short appressed scabrous pedicels. *Glumes* ca. equal, acuminate or aristate, 1.5–2.5 (–3.5) mm long, glabrous, prominently 1-nerved. *Lemma* 4–4.5 mm long, with few short appressed hairs on callus, scaberulous on nerves above, tapering into slender flexuous awn (5–) 10–20 mm long. *Palea* ca. as long as lemma, glabrous, or scaberulous between nerves. *Anthers* purple, 1.5–1.8 (–2) mm long.

Colorado, Utah, and Arizona, to western Texas and northern Mexico, on rocky hills and in canyons. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 2200–2750 m; Cerro Venado Blanco (Moran 15642), Arroyo Copal (Moran 15461), Yerba Buena (Moran & Thorne 14211), La Encantada (Wiggins & Demaree 4961), SE of La Encantada (Wiggins 16608).

Specimens of *M. pauciflora* and *M. arsenei* have

been confused, since both have rather knotty bases and narrow panicles with awned spikelets. *Muhlenbergia pauciflora* does not have a rhizomatous base, and the lemmas are glabrous or scabrous except for a few short appressed hairs on the callus.

Wiggins (1980:889, 890) included two species for which I have seen no Baja California collections. (1) *Muhlenbergia californica* Vasey is a rhizomatous perennial with scabrous blades 3–6 mm wide, spikelets 3–4 mm long, and scabrous lemmas tipped with short awns. It was thought to be endemic to the San Bernardino and San Gabriel Mountains of southern California, but Wiggins reported it from “foothills and lower mountain slopes of N B.C.” (2) *Muhlenbergia glauca* (Nees) B. D. Jackson [Index Kew. 2:269, 1894, thus antedating Mez, 1921] is a rhizomatous perennial with blades 2 mm or less wide, spikelets 3–4 mm long, and lemmas pilose on lower half and with awns 1–3 mm long. It occurs in the mountains from Texas to SE Arizona and adjacent Mexico. Early collections of *M. glauca* (Canby 58) and four other grasses are labeled as from Jamacha, in western San Diego Co., California; but because none of these species had since been found in the county, Higgins (1949:10) questioned the labels. According to Wiggins, *M. glauca* occurs in “Creosote Bush scrub, E San Diego Co., California, and adjacent B.C.”.

49. *Sporobolus* R. Br.

Annuals and perennials, the annuals mostly small, tufted, and delicate, the perennials various, some large and caespitose, others with stout rhizomes. *Ligule* usually a minute densely pilose membrane. *Leaves* often basally clustered, mostly linear and narrow, flat, folded, or involute. *Inflorescence* an open or contracted panicle of small awnless 1-flowered spikelets. *Disarticulation* above glumes. *Glumes* and *lemmas* 1-nerved, usually thin. *Paleas* well developed, mostly as long as lemma or longer. *Grain* obovate, somewhat asymmetrical.

1. Plants with stout creeping rhizomes; leaves of sterile shoots conspicuously distichous 1. *S. virginicus*
1. Plants lacking creeping rhizomes; leaves of sterile shoots not conspicuously distichous.
 2. Inflorescence open or narrow but not tightly contracted, at least some branches somewhat spreading.
 3. Anthers 1.2–2.5 mm long; plants with coarse and sometimes tall culms mostly densely caespitose from a hard base 2. *S. airoides*
 3. Anthers 0.2–0.4 mm long.
 4. Lower panicle branches usually in whorls of 4–12 or more at lowermost node 3. *S. pyramidatus*

4. Lower panicle branches solitary at nodes or 2–3 at lowermost node.
5. Second glume usually much shorter than lemma, commonly only half as long; leaf sheath collar glabrous 5. *S. atrovirens*
5. Second glume about as long as lemma; leaf sheath collar with lateral tufts of hair.
6. Panicle branches densely flowered, both branchlets and spikelets appressed along main branches; panicle axis slender but stiff, not strongly recurving 6. *S. cryptandrus*
6. Panicle branches loosely flowered, at least some widely spreading from main branches; panicle axis slender and weak, more or less recurved 7. *S. flexuosus*
2. Inflorescence tightly contracted, cylindrical; no branches spreading 4. *S. contractus*

1. ***Sporobolus virginicus* (L.) Kunth**, Rév. Gram. 1:67. 1829. SEASHORE DROPSEED. Coarse perennial with erect culms arising singly or in small clusters from extensive stout yellowish rhizomes. *Culms* smooth, shiny, the erect shoots mostly 10–50 cm tall. *Sheaths* mostly overlapping, glabrous except for a few hairs on each side of collar. *Blades* firm, usually involute on drying but sometimes flat, mostly 3–10 cm long and 1.5–4 or 5 mm broad. *Panicles* slender, tightly contracted and densely flowered, mostly 2–8 cm long and 6–7 mm thick. *Spikelets* glabrous, shiny, 1.8–3.2 mm long, the glumes and lemmas inconspicuously nerved. *First glume* variable in length, sometimes as long as second glume. *Second glume* as long as lemma or slightly longer. *Paleas* of same size and texture as lemmas. *Anththers* ca. 1.5 mm long.

Frequent on sandy beaches along the warmer coastlines of North, Central, and South America and the Caribbean; also in South Africa. BAJA CALIFORNIA SUR: Common along coast below 27°N; Islas Monserrate, Catalina, and San José.

2. ***Sporobolus airoides* (Torr.) Torr.**, Rept. Expl. R. R. Miss. Pacific 7(3):21. 1856. ZACATÓN ALCALINO, ALKALI SACATON. Coarse perennial, usually forming large clumps. *Culms* glabrous, mostly 0.5–2.0 m tall. *Sheaths* rounded, shorter than internodes, with long stiff hairs at side of collar. *Ligule* a ciliate membrane or absent. *Blades* coarse and tough, elongate, 2–6 mm broad, flat or involute. *Panicles* open, with spreading to ascending stiff branches. *Spikelets* 1.5–2.5 mm long. *Glumes* thin, hyaline, the first acute, ca. half as long as spikelet, the second longer and broader. *Anththers* 1.2–2.5 mm long.

1. Culms 0.3–1.0 m tall; panicle branches in age spreading, the branchlets naked below

..... 2a. *S. airoides* var. *airoides*
 1. Culms mostly 1–2 m tall; panicle branches ascending, the

- branchlets densely flowered nearly to base
 2b. *S. airoides* var. *wrightii*

2a. ***Sporobolus airoides* (Torr.) Torr. var. *airoides***. Culms mostly 0.3–1 m tall, to ca. 3 mm thick. *Blades* soon involute. *Panicle* mostly purplish, 20–45 cm long, 15–25 cm wide, the branches ascending, in age spreading, the branchlets naked below. *Pedicels* 0.5–2 mm long, spreading.

Western USA to northern Mexico, in meadows and valleys, especially in alkaline soils. BAJA CALIFORNIA NORTE: Tijuana; Valle Redondo, 220 m; Ojos Negros, 675 m; Sierra Juárez, 1000–1400 m (Mesa los Alacranes; NE of El Topo; Agua Flores; NW of El Rodeo; Los Pocitos); NW of San Telmo, 70 m.

2b. ***Sporobolus airoides* var. *wrightii* (Munro ex Scribn.) Gould**, Madroño 10:94. 1949. *S. wrightii* Munro ex Scribn. *S. altissimus* var. *minor* Vasey, Proc. Calif. Acad. Sci., Ser. 2, 2:213. 1889. *S. expansus* Scribn., Zoe 4:390. 1894. More robust, commonly 1–2 m tall, the culms to 9 mm thick. *Blades* often flat. *Panicle* mostly tawny or pale, 20–60 cm long, 12–25 cm wide, the branches more ascending, the secondary branches densely flowered nearly to base. *Pedicels* ca. 0.5 mm long, mostly appressed.

Southeastern California to Oklahoma, Texas, and central Mexico, on rocky slopes and open ground often in alkaline soils. BAJA CALIFORNIA NORTE: Sierra San Borja (San Enrique). BAJA CALIFORNIA SUR: Cape region; NE of Punta Pescadero; San José del Cabo.

The type of *S. altissimus* var. *minor* was collected by T. S. Brandegee at San Enrique in May 1889; it was referred here by Hitchcock (1935a:966). The type of *S. expansus* was collected near Pescadero by T. S. Brandegee 23 September 1893.

3. ***Sporobolus pyramidatus* (Lam.) Hitchc.** U.S. Dept. Agr. Misc. Publ. 243:84. 1936. *S. pulvinatus* Swallen. *S. argutus* (Nees) Kunth. ZACATÓN PYRAMIDAL, WHORLED DROPSEED. Fig. 46. Tufted perennial, the culms 10–50 cm tall, usually in small clumps. *Sheaths* shorter than culm internodes, usually glabrous except for a few hairs on upper margins and sometimes lateral tufts of hair on collar. *Blades* firm, usually flat, often stiff and tapering to slender tip, mostly 2–4 mm broad, ciliate on lower margins and often sparsely hispid on adaxial surface. *Panicles* 3–16 cm long, at first narrow and with contracted branches, later branches spreading and inflorescence becoming pyramidal; branches naked on lower 1/3–1/2, the lower in whorls of few to several, the upper successively shorter and most-



Fig. 46. *Sporobolus pyramidatus*: upper culm with panicle, spikelet. From Gould and Box, 1965.

ly single at nodes. *Spikelets* 1.5–2 mm long. *Glumes* thin, acute, the first short and broad, usually $\frac{1}{4}$ – $\frac{1}{5}$ as long as spikelet, the second usually as long as lemma. *Lemmas* 1.2–2 mm long, acute. *Paleas* broad, about as long as lemmas. *Anthers* 0.2–0.3 mm long. *Grains* plump, minutely rugose, mostly 0.6–0.8 mm long.

Kansas and Colorado, through Mexico, the Caribbean, and Central America, to South America, frequent on coastal sands and inland on sandy disturbed sites and saline clay or alkaline soils. BAJA CALIFORNIA SUR: At low elevations, mostly on coastal sands: Santa Rosalía, Loreto, Santa Rita, Pichilingue, La Paz, NE of Todos Santos, La Ribera, San José del Cabo, Cabo San Lucas; Isla Coronados.

4. *Sporobolus contractus* Hitchc., Amer. J. Bot. 2:303. 1915. SPIKE DROPSEED. Plants essentially like *S. cryptandrus*, but panicle remaining dense and contracted, the short erect branches densely flowered to base. *Panicles* mostly 15–50 cm long and 0.5–0.7 (–1) cm broad.

On open dry, usually sandy, sites, Colorado, Texas, Arizona, and southern California, to Baja California Sur and Sonora. BAJA CALIFORNIA NORTE: rocky hillside, La Hechicera, Sierra Juárez, 1225 m; granitic slope, Paso San Matías, 1000 m; sandy bottom of Cañón San Simón 5 km above mouth, 100 m. BAJA CALIFORNIA SUR: Along beach or on sandy flats immediately behind beach: Las Lagunas; Arroyo de San Gregorio.

5. *Sporobolus atrovirens* (H.B.K.) Kunth, Rév. Gram. 1:68. 1829. Low perennial, with culms 8–30 cm tall, usually in small dense tufts. *Leaves* glabrous, typically without hairs on sheaths or blades except ligule a minute ciliate membrane. *Blades* flat or involute, mostly 2–5 cm long and 1–2 mm broad. *Inflorescence* open, well-exserted, 3–15 cm long, with spikelets mostly clustered along primary branches or, in larger panicles, along primary and short secondary branches. *Glumes* short, unequal, the second variable in length but usually not more than $\frac{1}{2}$ as long as lemma. *Lemmas* and *paleas* dark, similar and about equal in length, mostly 1.2–1.5 mm long. *Grains* broadly rounded, flattened laterally, dull brown, mostly 0.7–0.9 mm long.

Central and southern Mexico, on open or brush-covered slopes. BAJA CALIFORNIA SUR: Cape region: El Taste (*Brandege* in 1893 and 1902, cited by Hitchcock, 1913:311, and confirmed by Charlotte Reeder).

An attractive low tufted grass with somewhat the aspect of *Sporobolus cryptandrus* but without hairs on leaf collar and with both glumes relatively short.

6. *Sporobolus cryptandrus* (Torr.) A. Gray, Man. 576. 1848. ZACATÓN DESGRANADOR. SAND DROP-SEED. Perennial with culms mostly 30–100 cm or more tall, usually in small to moderately large clumps. *Sheaths* rounded, glabrous on back, usually with tuft of long white hairs on each side of collar. *Ligule* a short fringed membrane. *Lower blades* elongate, flat or folded, glabrous or scabrous. *Panicles* 15–30 (–40) cm long, usually remaining partially enclosed by elongated upper sheath. *Primary panicle branches* narrowly spreading and floriferous to base or widely spreading and bare of spikelets below, the spikelets and branchlets tending to be appressed to primary branches. *Spikelets* subsessile or short-pedicelled, mostly 1.5–2.5 mm long. *Glumes* thin, membranous, acute, the first short, the second as long as spikelet. *Lemmas* and *paleas* thin, membranous, the palea broad but slightly shorter than lemma. *Anthems* 0.2–0.3 mm long. *Grains* broad, rounded, minutely rugose, ca. 1 mm long.

On dry loose sandy soils almost throughout temperate and subtropical North America except in SE USA; south to central Mexico. BAJA CALIFORNIA NORTE: Sierra Juárez, 1100–1700 m (between Ojos Negros and Neji; near Cañón Cantiles; NE of Cerro Piñón); Sierra San Pedro Mártir, ca. 2100 m (Corral de Sam; Santa Rosa). BAJA CALIFORNIA SUR: southwest coast about Bahía Magdalena (Boca de las Animas; S of El Pescador; San Carlos—all according to Charlotte Reeder).

7. *Sporobolus flexuosus* (Thurb.) Rydb. Bull. Torrey Bot. Club 32:601. 1905. MESA DROPSEED. Cespitose perennial with erect culms mostly 35–100 cm tall. *Sheaths* rounded, usually with tuft of long white hairs on each side of collar. *Panicles* open, usually 10–30 cm long and 4–9 cm broad, with main axis drooping or recurved above and primary branches widely spreading and divaricate or reflexed, with curved pubescent pulvini in their axils. *Spikelets* 1.9–2.5 mm long, lead-colored. *Glumes* unequal, lanceolate. *Lemma* and *palea* equaling or slightly shorter than upper glume.

Southern Utah to western Texas, southern California, and northern Mexico. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:895) in "desert areas below 1200 m, Creosote Bush Scrub, NE B.C.". We have seen no specimens.



Fig. 47. *Blepharoneuron tricholepis*: plant, glumes, floret. From Hitchcock, 1935.

50. *Blepharoneuron* Nash

1. *Blepharoneuron tricholepis* (Torr.) Nash, Bull. Torrey Bot. Club 25:88. 1898. PASTILLO DEL PINAR, PINE DROPSEED. Fig. 47. Cespitose perennial with stiffly erect culms 20–70 cm tall. *Leaves* mostly in basal cluster. *Ligule* a short rounded membrane. *Blades* filiform, involute, 2 mm or less broad, glabrous or scabrous. *Panicles* narrow, loosely contracted or open, usually 6–20 cm long. *Spikelets* 1-flowered, awnless, 2.5–3.8 mm long, bluish-gray,

on slender pedicels mostly 2–5 mm long. *Disarticulation* above glumes. *Glumes* broad, rounded on back, faintly nerved, somewhat unequal, the second slightly shorter than lemma. *Lemmas* firm, 3-nerved, pubescent on midnerve to above middle and on margins nearly to apex, the apex broad and rounded, occasionally apiculate. *Palea* large, puberulent between nerves.

Utah and Colorado to Arizona, New Mexico, Texas, and NW Mexico, mostly in open woodlands at medium to high elevations. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir, 2400–2800 m (e.g. above Arroyo Copal; Cerro la Cúpula; Vallecitos; W rim of Cañón Diablo; La Tasajera).

51. *Crypsis* Ait.

Annuals with commonly prostrate many-noded culms. *Leaf blades* short, flat; ligule a row of short hairs; sheaths short, rounded, the upper inflated, spatulate. *Inflorescence* of terminal and axillary dense spicate panicles. *Spikelets* 1-flowered, laterally compressed, disarticulating below glumes. *Glumes* 1-nerved, shorter than or equalling floret, the lower narrower. *Lemma* thin, 1-nerved. *Palea* hyaline, nearly or quite equalling lemma, 1- or 2-nerved, often splitting in fruit. *Grain* obovate; seed coat free from pericarp.

Our treatment is based on that of Hammel and Reeder (1980).

1. Collar and margins of sheath glabrous; glumes unequal, shorter than lemma, glabrous on margins; anthers mostly 0.9 mm long 1. *C. schoenoides*
1. Collar and margins of sheath pilose; glumes subequal, equalling or exceeding lemma, at least the lower pilose on margins; anthers mostly 0.6–0.7 mm long 2. *C. vaginiflora*

1. *Crypsis schoenoides* (L.) Lam., Tabl. Encycl. 1:166. 1791. *Heleochoa schoenoides* (L.) Host. Fig. 48e–i. Plants often pink to purplish. *Culms* commonly few branched, to 75 cm long, seldom less than 5 cm. *Leaves* 2–10 cm long; collar and sheath margins glabrous. *Panicles* mostly few per culm and separated, short-pedunculate, half or less included in leaf sheath, ovoid to cylindric, 3–75 mm long, 5–15 mm thick. *Spikelets* mostly 2.7–3.2 mm long. *Glumes* shorter than floret, the first shortest, their margins glabrous. *Anthers* 0.7–1.1 mm long.

Native to Eurasia and northern Africa; naturalized in western North America, especially in California, on drying lake margins and in vernal pools. BAJA CALIFORNIA NORTE: Shallow roadside depression just E of Tijuana airport tower, 150 m (Moran 27996).

2. *Crypsis vaginiflora* (Forssk.) Opiz. *Naturalien-tausch* 8:83. 1823. *C. niliaca* Fig. & DeNot. Fig. 48a–d. Plants mostly green. *Culms* much branched, to 30 cm long, in dwarf plants as little as 1 cm. *Leaves* 1–5 cm long; collar and sheath margins pilose. *Panicles* crowded and successively smaller on lateral branches, subsessile, mostly included in leaf sheaths, ovoid, 3–15 mm long, 3–6 mm wide. *Spikelets* mostly 2.5–3.2 mm long. *Glumes* both subequal to floret, the first pilose on margins. *Anthers* 0.5–0.9 mm long.

Native to northern Africa; naturalized widely in California and locally elsewhere in western North America, on drying lake margins and in vernal pools. BAJA CALIFORNIA NORTE: In vernal pool and in sandy to mucky soil near pond behind coastal dunes 1–2 km N of El Ciprés, S of Ensenada, 5 m (Moran 28558, 28632, 29078, 29081). Reported by Wiggins (1980:888) as sparingly present around vernal pools on mesas between Tijuana and Ensenada.

Tribe 11. Chlorideae

52. *Cynodon* L. Rich.

1. *Cynodon dactylon* (L.) Pers., Syn. Pl. 1:85. 1805. PATA DE GALLO, BERMUDA GRASS. Fig. 49. Low sod-forming rhizomatous and stoloniferous perennial. *Culms* mostly stoloniferous, with slender erect flowering branches mostly 10–50 cm tall. *Sheaths* with tuft of hair on each side of collar and into ligular area. *Ligule* a ciliate membrane 0.2–0.5 mm long. *Blades* glabrous, flat, linear, 1–3 (–4) mm broad. *Inflorescence* of usually 3–5, occasionally 2–7, digitately arranged slender spicate branches mostly 2–6 cm long and floriferous to base. *Spikelets* sessile or nearly so, awnless, with single perfect floret, the rachilla prolonged behind palea and often bearing rudimentary floret. *Glumes* 1-nerved, lanceolate, slightly unequal, the second about $\frac{2}{3}$ as long as lemma. *Lemmas* 2–2.5 mm long, firm, shiny, acute, 3-nerved. *Paleas* narrow, slightly shorter than lemma.

Native to warm parts of Africa but now widespread in warmer regions of the world. Frequent from central and southern USA to South America, cultivated as a lawn or forage grass, established as a common weed of roadsides, ditches, and waste places, and often naturalized in wild areas. BAJA CALIFORNIA: Common as a weed in inhabited areas and occasional elsewhere: at edge of salt marsh, in arroyo beds, and in meadows, mostly at low elevations but to 1675 m in Sierra San Pedro Mártir; Islas los Coronados and Cedros.



Fig. 48. *Crypsis*: a-d, *C. vaginiflora*: a, spikelet; b, culm with leaves and panicle; c, grain; d, plant. e-i, *C. schoenoides*: e, spikelet; f, floret; g, culm with leaves and panicle; h, grain; i, plant. From Mason, 1957.

Beetle (1977a:342) listed *Cynodon plectostachyum* (Schum.) Pilger (PASTO ESTRELLA) as "persistent after cultivation" in Baja California Sur. Harlan et al. (1964) described this as a large robust diploid ($2n = 18$) with long thick stolons but without rhizomes. We have seen no specimens.

53. *Microchloa* R. Br.

1. *Microchloa kunthii* Desv., Opusc. 75. 1831. *M. indica* of Hitchc., not Kuntze. *Paspalum tenuissimum* M. E. Jones, Contr. W. Bot. 18:24. 1933. Fig. 50. Tufted perennial with slender culms mostly 10–25 cm tall. *Ligules* ciliate, 1–1.5 mm long. *Blades* filiform, rarely over 1 mm broad, usually involute. *Inflorescence* a curved filiform unilateral spike mostly 3–8 cm long and 1–1.5 mm thick. *Spikelets* closely imbricated in 2 rows on one side of flattened rachis, 1-flowered, awnless, disarticulating above or between glumes. *Glumes* 1-nerved, lanceolate, subequal, 2–3 mm long. *Lemmas* thin, slightly



Fig. 49. *Cynodon dactylon*: plant with rhizomes and stolons, inflorescence, glumes, floret. From Gould, 1951, 1965.

shorter than glumes, faintly 3-nerved at base, ciliate and broad above. *Palea* similar to lemma but shorter. *Caryopsis* reddish-brown, oval, flattened, slightly over 1 mm long.

Southern Arizona (Sycamore Canyon) to Mexico and Argentina, on dry gravelly hills and plains, in both sandy and clayey soils. BAJA CALIFORNIA SUR: Hitchcock (1913:328) cited three collections of this relatively rare species from the Cape region: Sierra San Francisquito (*Brandeggee in 1899*); La Chuparosa (*Brandeggee in 1893*); El Taste (*Brandeggee in 1893*).

The type of *Paspalum tenuissimum* (Jones 27584) is from "the prairie at the laguna, Laguna mts., L. Calif., lower temperate life zone, 6500 ft. alt., and along the down trail . . . in granite gravel along with *Bouteloua oligostachya*" (Jones, 1933:24). Jones thought it "strange that Brandeggee and Goldman did not get this very common grass on the Laguna mesa".

54. *Chloris* Sw.

Annuals and perennials of diverse habit. *Culms* and *leaves* usually glabrous, occasionally pilose. *Ligule* a ciliate rim or absent. *Inflorescence* of usu-



Fig. 50. *Microchloa kunthii*: plant, spikelet, floret. From Chase, 1951.

ally 5–25 unilateral spicate branches verticilled or clustered at apex of flowering culm. *Spikelets* closely or distantly spaced in 2 rows on branch, with 1 (rarely 2) perfect florets and 1–3, usually 1, sterile floret above. *Disarticulation* above glumes. *Glumes* usually unequal, lanceolate or acuminate,

1-nerved, shorter than lemmas. *Lemma* of perfect floret awned or awnless, 3-nerved, the nerves often pubescent. *Reduced floret* or *florets* rudimentary to inflated-obovoid, awned or awnless.

This treatment is based on the monograph of Dennis E. Anderson (1974).

1. Plants annual; upper margins of fertile lemma long-ciliate with spreading hairs 1. *C. virgata*
1. Plants perennial.
2. Lemmas 1-awned.
3. Spikes up to 20, in 2 or more well-separated verticils; sterile floret one.
4. Cleistogamous underground spikelets borne on slender rhizomes; awn of fertile lemma 6.5–15 mm long 2. *C. chloridea*
4. Cleistogamous underground spikelets lacking; awn of fertile lemma 1–4.5 mm long 3. *C. brandegei*
3. Spikes 9–30, in one terminal verticil; sterile florets 2–4 5. *C. gayana*
2. Lemmas 3-awned 4. *C. crinita*

1. *Chloris virgata* Sw., F. Ind. Occ. 1:203. 1797. VERDILLO PLUMERITO, ZACATE MOTA, SHOWY CHLORIS. Fig. 51. Weedy annual, extremely variable in size and habit, but culms usually numerous, geniculate-spreading below, mostly 15–60 cm tall but taller under optimum growing conditions. *Lower sheaths* laterally compressed, keeled. *Ligule* short, ciliate, sometimes absent. *Blades* thin, flat, usually 3–8 mm broad but occasionally much broader, glabrous or, less frequently, pilose. *Panicles* with 4–20 erect spicate branches tightly clustered at culm apex, the branches 2–6 (–10) cm long. *Spikelets* closely imbricated in 2 rows to base of branch rachis, with single reduced floret above perfect one. *Glumes* unequal, the second acute to short-awned, ca. as long as lower lemma. *Lemma* of lower floret 2.5–4.2 mm long, notched at apex and with awn 2.5–4.2 mm long, the midnerve and lower part of marginal nerves variously pubescent to nearly glabrous, the upper margins with tufts of long hairs. *Reduced floret* broad and truncate at apex, with awn usually 3–9.5 mm long.

Worldwide in tropical and warm-temperate regions, common in open disturbed soils. BAJA CALIFORNIA SUR: Common from near coast to over 1000 m, from near Asunción (27°13'N) to Cape region; Isla Magdalena.

2. *Chloris chloridea* (Presl) Hitchc., Proc. Biol. Soc. Wash. 41:162. 1928. VERDILLO CACAHAU-TOIDE, BURYSEED CHLORIS. Perennial with stiffly erect culms to 1 m tall from firm base; slender branched rhizomes bearing cleistogamous spikelets characteristically developed. *Lowermost sheaths* laterally flattened and keeled. *Ligules* of lower

leaves fringed with hairs 3–5 mm or more long, those of upper leaves reduced. *Blades* flat, folded, or involute, scabrous, occasionally pilose, 3–8 (–10) mm broad. *Inflorescence* with 3–15 long slender spreading often flexuous branches; these solitary, paired, or in verticels of 3–4 at widely separated rachis nodes. *Spikelets* appressed and rather widely spaced on branch rachis. *Glumes* glabrous except for scabrous midnerve, narrowly lanceolate, unequal, shorter than lemma. *Lemma* of lower floret narrowly lanceolate, with scabrous back and ciliate margins, 4.5–7.4 mm long, with awn 6.5–15 mm long. *Reduced floret* slender, scabrous to short-pilose, 1.4–3 mm long, with awn 1.4–3 mm long.

Texas, southern Arizona, and northern Mexico, to Honduras, in low grassy areas and occasionally on pastured brushy slopes. BAJA CALIFORNIA SUR: Anderson (1974) referred to this species a collection from El Triunfo (Jones s.n., 6 Oct. 1930). See under *C. brandegei*.

3. *Chloris brandegei* (Vasey) Swallen, Amer. J. Bot. 22:41. 1935. *Diplachne brandegei* Vasey in Brandegee, Proc. Calif. Acad. Sci. Ser. 2, 2:213. 1889. *Goninia brandegei* (Vasey) Hitchc. Perennial with culms to 1 m tall from coarse firm base. Similar to *Chloris chloridea* except in lacking underground spikelets on slender rhizomes and in having lemma awns 1–4.5 mm long rather than 6.5–15 mm long (Anderson, 1974).

Endemic to southern Baja California. BAJA CALIFORNIA SUR: On rocky hillsides and sandy flats and along arroyos, commonly at low elevations but also to 1100 m, from SE of San Ignacio to Cape region: Islas Coronados, Carmen, Danzante, Monserrate, and San José. The type was collected by T. S. Brandegee on Isla Magdalena in 1889.

Possibly *C. brandegei* is only a variant of *C. chloridea*; their relationship needs further study. Two collections (Bahía Pulpito, Moran 9078; San Antonio, Gould 12161) have slender rhizomes but also have the short-awned lemmas of *C. brandegei*. The only Baja California collection of *C. chloridea* cited by Anderson (1974) is by Jones from El Triunfo; but another Jones collection from El Triunfo is cited as *C. brandegei*.

4. *Chloris crinita* Lag., Nov. Gen. Sp. 5. 1816. *Trichloris crinita* (Lag.) Parodi. Cespitose perennial with stiffly erect culms to 1 m tall; short stolons occasionally produced. *Lower sheaths* keeled and laterally compressed, glabrous or hirsute. *Blades* long and relatively narrow, mostly 2–5 mm broad. *Panicles* with 6–20 erect bristly branches closely



Fig. 51. *Chloris virgata*: plant, glumes, florets. From Hitchcock, 1935.

clustered on upper part of the inflorescence axis, the branches usually 8–15 cm long. *Spikelets* closely placed on branch axis. *Spikelets* 2- (rarely 3-) flowered, the upper floret reduced. *Glumes* 1-nerved, lanceolate-attenuate, usually short-awned. *Lemma* of lower floret dorsally flattened, scabrous above middle, 3-nerved and 3-awned, the body 2.4–3.8 mm long, the central awn 8–12 mm long the lateral awns shorter. *Reduced floret* cylindrical, 1–1.5 mm long, gradually narrowing to subequal awns 5–7 mm long.

Texas to Arizona and through western Mexico to South America, usually in heavy alluvial soils of bottomlands. BAJA CALIFORNIA SUR: Arroyo 8 km S of Pescadero, Cape region (Moran 7020).

5. *Chloris gayana* Kunth, Rév. Gram. 1:89. 1829. RHODES GRASS. Perennial with glabrous erect culms 1–1.5 m or more tall and commonly with long leafy

stolons. *Ligule* a ciliate fringe. *Blades* flat, scabrous, to 30 cm long and 1.5 cm wide. *Panicles* of 9–30 ascending pale spikes 8–15 cm long, with imbricate spikelets. *Glumes* lanceolate, scabrous, the first 1.4–2.8 and the second 2.2–3.5 mm long. *Fertile lemma* 2.5–4.2 mm long, prominently hairy on upper margins, with awn 2–6 mm long. *Reduced florets* 2–4, the first like fertile lemma but smaller, awned, often staminate.

Native to Africa but widely grown as a forage grass in warm regions and widely naturalized. BAJA CALIFORNIA NORTE: Planted in Valle de Mexicali (S of Puebla, 10 m, Moran 29759).

55. *Bouteloua* Lag.

Annuals and perennials, some with stolons and rhizomes. *Leaves* mostly basal, with rounded sheaths and linear flat or folded blades. *Ligule* commonly a ring of hairs. *Inflorescence* with 1 to numerous short spicate branches scattered along slender main rachis, each branch with 1 to many sessile spikelets. *Disarticulation* at base of inflorescence branch in one section of the genus and above glumes in the other. *Spikelets* with 1 perfect floret and 1–3 staminate or sterile florets above. *Glumes* 1-nerved, lanceolate. *Lemma* of perfect floret 3-nerved, awnless or awned. *Palea* well-developed, the 2 nerves occasionally awn-tipped.

This treatment is based on the revision by Gould (1980).

1. Inflorescence branches deciduous at maturity, the spikelet falling with branch; spikelets all or mostly 1–16 per branch.
2. Inflorescence branches 1–20 per culm.
3. Upper floret typically neuter, reduced to cylindrical awn column and 3 awns of equal or nearly equal length.
4. Inflorescence branch rachis sharp-pointed at base, densely pubescent, at least near base; spikelets appressed to rachis 1. *B. aristidoides*
4. Inflorescence branch rachis not sharp-pointed at base, glabrous or scabrous; spikelets spreading from rachis 2. *B. annua*
3. Upper floret staminate or neuter, well-developed, usually as large as or larger than lower floret 3. *B. repens*
2. Inflorescence branches 25–100 per culm.
5. Culms with 1–2 (–3) nodes elevated above base of plant; spikelets relatively large, the second glume usually 6–8 mm long; upper floret usually neuter but well-developed 4. *B. curtipendula* var. *caespitosa*
5. Culms typically with 4–7 nodes elevated above base of plant; spikelets relatively small, the second glume 3–5 (–6) mm long; upper floret greatly reduced, sometimes represented by awn column alone, the body completely reduced 5. *B. reflexa*
1. Inflorescence branches persistent, the spikelets disarticulating above glumes; spikelets all or mostly 20–60 per branch.

6. Plants perennial.
7. Second (outer) glume with papilla-based hairs.
8. Inflorescence branch rachis projecting beyond terminal spikelet 6. *B. hirsuta*
8. Inflorescence branch rachis not projecting beyond terminal spikelet 7. *B. gracilis*
7. Second (outer) glume glabrous or scabrous.
9. Culm internodes, at least the lower, woolly-pubescent 11. *B. eriopoda*
9. Culm internodes not woolly-pubescent.
10. Lemma of lower floret glabrous, with awn usually 5 mm or more long 8. *B. trifida*
10. Lemma of lower floret pubescent below, with awn 2–3 mm long 9b. *B. barbata* var. *rothrockii*
6. Plants annual; culms weak, usually spreading.
11. Inflorescence usually with 3–7 short spreading spicate branches 9a. *B. barbata* var. *barbata*
11. Inflorescence a unilateral spike 10. *B. simplex*

1. *Bouteloua aristidoides* (H.B.K.) Griseb., Fl. Brit. W. I. 537. 1864. NAVAJITA AGUJA, NEEDLE GRAMA. Fig. 52. Tufted short-lived annual with weak slender spreading-erect culms mostly 6–50 cm long. *Sheaths* usually much shorter than internodes. *Ligule* a puberulent rim. *Blades* thin, short, 1–2 mm broad, usually glabrous but occasionally with a few long hairs at base. *Inflorescence* mostly 2.5–10 cm long, with usually 4–15 widely spaced spreading readily deciduous short branches; branches mostly 1–2 cm long and with 1–4 appressed spikelets, with sharp-pointed hairy basal callus; branch rachis flattened, with curved tip extended 5–10 mm beyond insertion of terminal spikelet. *Lemma of lowermost spikelet* awnless or minutely awned, usually without rudiment (upper floret). *Upper spikelets* with 3-awned lemma; rudiment reduced to awn column and awns mostly 2–6 mm long. *Glumes* unequal, acute or acuminate. *Lemma* ca. as long as upper glume, with short or long awns. *Caryopsis* narrow, mostly 2.5–3 mm long.

Texas to California and south through Mexico; also in South America to Argentina; mostly in loose sandy soil at low elevations. BAJA CALIFORNIA: In the NW chiefly at 900–1200 m (to 1550 m) N and S from Paso San Matías (e.g. SE of San Salvador; Arroyo Alamar); common in desert areas, mostly at low elevations, south to Cape region; Islas Coronados and Carmen and probably others.

Bouteloua aristidoides is the weediast of the grama grasses and one of the commonest grasses of Baja California Sur. Frequently this tufted annual has greatly reduced inflorescences with much reduced short-awned spikelets.

2. *Bouteloua annua* Swallen, J. Wash. Acad. 25:414. 1935. Tufted annual with culms mostly 5–

25 cm tall, usually forming dense clumps; but often very small and depauperate on dry sites. *Sheaths* glabrous, much shorter than internodes. *Ligule* a minute ciliate rim. *Blades* thin, flat, folded or involute, short, mostly 1.5–2 mm broad, often pubescent on adaxial surface. *Inflorescence* with usually 2–7 spicate branches 1.5–2.5 cm long and with 4–9 spikelets. *Glumes* lanceolate, unequal, the second broad, usually 6–8 mm long. *Lemmas* mostly 7–9 mm long, 3-lobed, often with 3 short awns. *Upper floret* rudimentary, reduced to 3 awns 5–7 mm long.

Endemic to southern Baja California, on dry rocky slopes. BAJA CALIFORNIA SUR: "4 miles east of San Ignacio" (Shreve 7032, the type collection); Santa Rosalía; Ligüí; La Paz; Todos Santos.

3. *Bouteloua repens* (H.B.K.) Scribn. & Merr., Bull. U.S.D.A. Div. Agrost. 24:26. 1901. *B. filiformis* (E. Fourn.) Griffiths. NAVAJITA PELILLO, SLENDER GRAMA. Low tufted perennial with culms 15–45 cm tall. *Ligule* a minute fringed membrane. *Blades* linear, thin, flat, 1–3 (–5) mm broad, glabrous or sparsely hirsute. *Inflorescence* of 3–9 (–12) short deciduous spicate branches bearing usually 3–9 awned spikelets, the branch with spikelets mostly 1.5–3 cm long. *Spikelets* with 1 large well-developed staminate or neuter floret above perfect one. *Rachilla* often extended as short awn. *First glume* 4–7 mm long, the second slightly longer. *Lemma of lower floret* 4.5–8 mm long, glabrous or occasionally bearded at base, awnless or with 1 or 3 short awns. *Palea* narrow but usually slightly longer than body of lemma. *Anthers* 3–4.5 mm long.

Southern Texas, New Mexico, and Arizona, through Mexico, Central America, and the Caribbean, to Venezuela and Columbia, in a wide variety of grassland, brushland, and shoreline habitats. BAJA CALIFORNIA SUR: On rocky slopes at low to moderately high elevations; La Paz; Triunfo, 365 m; Sierra el Taste, 1230 m.

Throughout its range *B. repens* shows considerable morphological variation and also has three levels of ploidy: diploid ($2n = 20$), tetraploid ($2n = 40$), and hexaploid ($2n = 60$). Plants of west-coast Mexico, including Baja California, apparently all are hexaploid (Gould, 1969).

4. *Bouteloua curtipendula* (Michx.) Torr. var. *caespitosa* Gould & Kapadia, Brittonia 16:203. 1964. Fig. 53 [var. *curtipendula*]. NAVAJITA BANDERILLA, SIDEOATS GRAMA. Perennial with stiffly erect culms mostly 0.5–1 m tall in small to large clumps from firm, often knotty base; creeping rhizomes absent.



Fig. 52. *Bouteloua aristidoides*: plant, inflorescence branch with two spikelets, lowermost spikelet. From Gould, 1951.

Ligule a short dense fringe of hairs. *Blades* linear, firm, flat, mostly 3–6 mm broad, usually ciliate on lower margins. *Inflorescence* usually with 25–80 short pendent branches, the lower ones longer, averaging 1.5–2.5 cm long, with 2–7 spikelets. *Glumes* glabrous or scabrous, lanceolate, unequal, the second usually 5.5–8 mm long. *Lemma of perfect floret* usually slightly shorter than second glume, glabrous or scabrous-strigose, acute or slightly 3-toothed and with the 3 nerves extended as short awns. *Paleas* shorter than lemmas and similar in texture. *Rudimentary upper floret* usually consisting of lemma with short membranous base and 3 unequally developed awns, the terminal one occasionally as much as 7 mm long. *Anthers* usually orange, occasionally yellow or maroon.

Utah, Colorado, and Oklahoma, through Mexico, and in South America to Argentina; in loose sandy or rocky, often limey, soils. BAJA CALIFORNIA NORTE: Sierra Juárez, 1050–1700 m (Valle los Pinos; E of Rancho San Pedro; N of Laguna Hanson; Cerro Prieto; SSE of El Rodeo; Cañada Rincón; Portezuelo de Jamaú); NE of Cerro Piñón, 1100 m; Sierra San Pedro Mártir, 775–2050 m (Paso San Matías; Arroyo Picacho; Cañón del Diablo; Rancho



Fig. 53. *Bouteloua curtipendula* [var. *curtipendula*]: plant, spikelet with glumes separate. From Gould, 1951. [Var. *caespitosa* is from knotty base, lacking rhizomes.]

San Pedro Mártir; Arroyo la Grulla; Santa Rosa). BAJA CALIFORNIA SUR: Cerro la Laguna, Sierra San Francisco, 1450 m (Moran 23848); Cerro Mechudo, Sierra de la Giganta, 940 m (Moran 18928).

5. *Bouteloua reflexa* Swallen, N. Amer. Fl. 17:632. 1939. SACATE MATEADO. Plants perennial from hard knotty base. Culms stiffly erect, mostly 60–120 cm or more tall, with numerous (4–9) nodes and elongated internodes. Ligules membranous, often ciliate, 1–2 mm long. Blades flat and narrow, mostly 2–6 mm broad. Inflorescences 15–30 cm long, with usually 40–100 short spreading or reflexed readily deciduous spicate branches, each typically bearing 3–9 widely spaced small spikelets, usually only the terminal 1 or 2 spikelets developing seed. Spikelets pale green, straw-colored, or yellowish-brown, rarely purplish. Glumes lanceolate, slightly unequal. Lemmas mostly 4–6 mm long, the 3 nerves usually extended into short awns. Upper floret irregularly and poorly developed, the lateral awns

short or absent, the central awn usually 3–8 mm long but occasionally shorter. Anthers usually orange or maroon-orange.

Western Mexico, on exposed rocky slopes and brushy hills at low elevations. BAJA CALIFORNIA SUR: Sierra de la Giganta to Cape region, from sea level to 850 m; all islands from Isla Coronados to Isla San Francisco.

6. *Bouteloua hirsuta* Lag., Var. Cienc. 4:141. 1805. NAVAJITA VELLUDA, HAIRY GRAMA. Cespitose perennial. Culms mostly 15–40 cm tall, usually with 4–6 nodes and elongated internodes. Sheaths glabrous or thinly pilose. Ligule a short ciliate membrane. Blades thin, flat or subinvolute, 1–2 (–3) mm broad, glabrous or sparsely ciliate on lower margins. Inflorescence with 1–4 short divergent spicate branches mostly 2.5–4 cm long and with 20–50 closely placed pectinately spreading spikelets. Branch rachis tapering to sharp point 5–8 mm or more long beyond terminal spikelet. Spikelets 4–7 mm long, with 2 rudimentary florets above perfect one. Glumes unequal, the first 1.5–3 mm long, minutely hispid, the second 3–5 mm long, with papilla-based hairs on midnerve and with short-awned apex. Lemma 5–6 mm long, more or less puberulent. Lowermost rudiment with 3 hispid awns ca. 4 mm long, the upper rudiment a minute scale. Rachilla not hairy below lower rudiment. Anthers usually yellow, 2–2.5 mm long. Caryopsis ovate, 1.5–2 mm long.

1. Culm internodes glabrous 6a. *B. hirsuta* var. *hirsuta*
1. Culm internodes hirsute 6b. *B. hirsuta* var. *glandulosa*

6a. *Bouteloua hirsuta* Lag. var. *hirsuta*. Wisconsin and North Dakota through central and western USA and Florida and throughout most of Mexico, in grassland and woods borders in a wide variety of soils. BAJA CALIFORNIA NORTE: Cerro Prieto, east rim of Sierra Juárez, 1650 m (Moran 18117). BAJA CALIFORNIA SUR: Cerro la Laguna, Sierra San Francisco, 1450 m (Moran 23849 in part); Sierra de la Laguna, 1900 m (Carter et al. 2385).

6b. *Bouteloua hirsuta* var. *glandulosa* (Cerv.) Gould, J. Arnold Arbor. 60:320. 1979. *B. glandulosa* (Cerv.) Swallen. *B. hirticulmis* Scribn., Circ. U.S.D.A. Div. Agrost. 30:4. 1901. Apparently differing from the var. *hirsuta* only in the hirsute culms.

Central and western Mexico, in rocky soil on open or brushy slopes, in Baja California at 1500–1900 m. BAJA CALIFORNIA SUR: Sierra San Francisco; Sierra de la Laguna; Sierra San Francisquito

(Brandege 11, 29 Sept. 1899, type of *B. hirticulmis*). Moran collected vars. *hirsuta* and *glandulosa* at one place in Sierra San Francisco and Carter at one place in Sierra de la Laguna.

7. *Bouteloua gracilis* (H.B.K.) Griffiths, Contr. U.S. Natl. Herb. 14:375. 1912. Perennial, often with short rhizomes. Culms mostly 25–60 cm tall, erect or geniculate-spreading at base, with glabrous or minutely pubescent nodes. Ligule a fringe of short hairs, often with long hairs on margins. Blades short, flat, 1–2.5 mm broad. Inflorescence with 1–3 (–4) thick and densely flowered branches 1.5–5 (–7) cm long. Branch rachis terminating in spikelet. Spikelets commonly 40–90 or more per branch, closely placed and pectinately spreading. First glume glabrous or hirsute. Second glume hirsute on midnerve with papilla-based hairs. Lemmas 4–5.5 mm long, pubescent at least below.

Widespread in northern and western North America and to southern Mexico in the highlands. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:903) from dry hillsides, mesas, and bajadas, in northern Baja California; but we have seen no specimens.

8. *Bouteloua trifida* Thurb. in S. Wats., Proc. Amer. Acad. Arts 18:177. 1883. RED GRAMA. Perennial with slender wiry culms 8–30 (–40) cm long, densely tufted from firm, often somewhat rhizomatous base. Leaves mostly in basal clump, glabrous or puberulent. Ligule a minute fringed membrane. Blades mostly 4–8 cm long and 1.5 mm or less broad. Inflorescence with 2–7 slender persistent branches, each 1.2–2.5 cm long, with 8–24 (–32) spikelets. Spikelets ca. 2 mm long, with one rudimentary floret above perfect one. Glumes glabrous, acute, acuminate, or slightly mucronate. Lemma glabrous or with hairs at base not over 0.5 mm long, with awn ca. twice as long as body. Rudiment with short awn column and awns 3.5–6 mm long.

Southern Utah to Texas and southern California and through much of Mexico, on dry plains and rocky slopes. BAJA CALIFORNIA NORTE: Granitic south slope with *Pachycereus*, *Fouquieria*, *Agave*, Cañón San Matías 11 km E of San Matías, 700 m (Moran 24797).

9. *Bouteloua barbata* Lag., Var. Cienc. 4:141. 1805. *B. arenosa* Vasey. NAVAJITA ANUAL, SIXWEEKS GRAMA. Low tufted annual or weak perennial with spreading or erect culms 8–40 cm tall. Sheaths with tuft of hair on each side of collar. Ligule a short

fringed membrane. Blades thin, mostly 1.5–7 cm long and 1–1.5 (–3) mm broad, occasionally stri-gose. Inflorescence with usually 3–7 narrow persistent branches each typically 1–3 cm long, with 25–40 closely placed and pectinately spreading spikelets. Spikelets 2.5–4 mm long including short awns, usually with 2 rudimentary florets above perfect one. Glumes glabrous, unequal, acute or acuminate. Rachilla with silvery tuft of hairs below awned (lower) rudiment. Lemma of perfect floret lobed and 3-awned, the awns from shorter than lobes to 3 mm long. Body of lemma densely pubescent, at least on margins. Lower rudiment with rounded lobes and 3 awns ca. as long as those of lemma. Upper rudiment reduced to minute inflated awnless vestige.

1. Plants annual; culms geniculate-spreading at base, occasionally rooting at lower nodes 9a. *B. barbata* var. *barbata*
1. Plants perennial, usually short-lived; culms usually erect from base 9b. *B. barbata* var. *rothrockii*

9a. *Bouteloua barbata* Lag. var. *barbata*. *Chondrosium polystachyum* Benth., Bot. Voy. Sulphur 56. 1844. *B. polystachya* (Benth.) Torr. Fig. 54.

Southwestern USA, through Mexico to Guerrero, and in Argentina, an inconspicuous grass of rocky slopes, open plains, roadsides, and waste places, usually in sandy soils. BAJA CALIFORNIA: In the NW at 900–1300 (–1550) m, Sierra Juárez and N Sierra San Pedro Mártir (e.g. Agua Hechicera; Cerro Chichi de la India; Portezuelo de Jamau; Paso San Matías; Lázaro Cárdenas; Arroyo Alamar); common in deserts to Cabo San Lucas; Islas Ángel de la Guarda, Carmen, Monserrate, San José, and Espíritu Santo, and probably others. The type of *Chondrosium polystachyum* was collected by Barclay at Bahía Magdalena.

9b. *Bouteloua barbata* var. *rothrockii* (Vasey) Gould, Ann. Missouri Bot. Gard. 66:403. 1979. *B. rothrockii* Vasey. *B. polystachya* var. *major* Vasey. Tufted short-lived perennial with wiry culms usually 25–60 (–75) cm tall. Culms stiffly erect or slightly geniculate and spreading below. Sheaths glabrous. Blades glabrous or sparsely hirsute, 1–3 (–4) mm broad. Inflorescence branches (3–) 4–8 per culm, mostly 1.5–3 cm long and ca. 3 mm broad excluding awns. Spikelets usually 35–50 per branch, closely placed and pectinate on rachis, about 5 mm long. Lemma pubescent below, broad and lobed above, with awn 1.5–3 mm long from notched apex. Reduced florets 1 or 2, the lower



Fig. 54. *Bouteloua barbata* var. *barbata*. From Gould, 1951.

reduced to awn column and 3 stout awns, the upper when present fan-shaped, awnless.

New Mexico, Arizona, southern California, and through NW Mexico to Durango and Sinaloa, on dry slopes and sandy flats. BAJA CALIFORNIA SUR: Cape region: sandy plain S of La Paz (*Rauh* 25499); Arroyo Salate (*Purpus* 401); sandy roadside above beach, Cabo San Lucas (*Moran* 19047).

10. *Bouteloua simplex* Lag., Var. *Cienc.* 4:141. 1805. MAT GRAMA. Tufted annual with usually spreading culms 3–20 (–30) cm tall. *Sheaths* glabrous. *Ligule* a minute fringed membrane. *Blades* 2–10 cm long and 0.5–1.5 mm broad, often pilose on adaxial surface and ciliate on margins above lig-

ule. *Inflorescence* a unilateral spike (actually a single terminal branch) 1–2.5 cm long, with 30–80 closely placed pectinate spikelets. *Spikelets* with perfect floret below and 1–2 rudimentary florets above. *Rachilla* with tufts of hair below lower floret and first rudiment. *Disarticulation* at base of lower floret. *Glumes* glabrous, or scabrous at tips, the first ca. half as long as second, the second 3.5–5 mm long. *Lemma* body 2.5–3.5 mm long, pubescent on nerves, with 3 short stout awns. *Lower rudiment* a stout awn-column and three awns 1–2 mm long, the membranous body vestigial or absent. *Upper rudiment*, when present, an awnless fan-shaped scale.

Colorado, Utah, and western Texas, through Mexico to Guerrero, and widespread in South America, mostly on dry open slopes and plains, at intermediate to high elevations. BAJA CALIFORNIA SUR: San José del Cabo (*Jones* in 1928).

11. *Bouteloua eriopoda* (Torr.) Torr. U.S. Rep. Expl. Miss. Pacif. 4:155. 1856. BLACK GRAMA. Perennial with wiry culms 20–60 cm long from knotty base. *Culms* usually decumbent and often stoloniferous below, woolly-pubescent on lower internodes. *Blades* flat or folded, 0.5–2 mm broad. *Inflorescence* with 3–8 widely spaced persistent slender floriferous branches, mostly each 2–5 cm long, with 8–18 non-pectinate spikelets. *Branch rachis* densely white-woolly at base. *Spikelets* with single awned rudiment above perfect floret. *Lemma* 1.5–3 mm long, bearded at base, tapering above to stout awn and much-reduced lateral awns. *Rudiment* usually bearded at base, with 3 awns 4–8 mm long and firm, non-membranous base.

On dry slopes and plains, Colorado and Utah to Arizona and northern Mexico. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:903) on “dry rocky hillsides, mesas, and bajadas, N B.C.”; but we have seen no specimens.

Wiggins (1980:903) also reported *Bouteloua radicata* (E. Fourn.) Griffiths from “rocky hillsides and canyons, NE B.C.”. It is highly doubtful that this grass occurs on the peninsula: possibly the record is based on robust plants of *B. repens*.

56. *Aegopogon* Humb. & Bonpl.

Tufted annuals, with slender curving-erect culms mostly 10–40 cm tall. *Ligule* an acute or lacerate membrane 1–2 mm long. *Blades* thin, flat, glabrous or puberulent, 1–6 (–10) cm long and 1–1.5 mm broad. *Inflorescence* usually 2–8 cm long, with usually 15–20 or more short-peduncled spikelet



Fig. 55. *Aegopogon tenellus*: plant, group of spikelets, lateral and central spikelets. From Hitchcock, 1935.

clusters (inflorescence branches) 2.5–3 mm long exclusive of peduncle and awns. *Spikelet* cluster of 2–3 spikelets, one sessile or nearly so and perfect, the other 1–2 with longer pedicels and staminate or neuter. *Lemma of perfect spikelet* 3-lobed at apex, 3-nerved and 3-awned, the midnerve awn 3–4 times as long as lemma body. *Glumes of perfect spikelet* 1-nerved, narrow, awned. *Lemmas of reduced spikelets* with awn 3 or more times as long as body, sometimes reduced to only the awn.

1. Glumes and lemmas of staminate and neuter spikelets with narrow margins and narrowing above to a pointed or erose apex; one spikelet of cluster sessile or short-pedicel 1. *A. cenchroides* var. *breviglumis*
1. Glumes and lemmas of staminate and neuter spikelets with broad margins and broad lobes at apex; all spikelets of cluster distinctly pedicel 2. *A. tenellus*

1. ***Aegopogon cenchroides*** Humb. & Bonpl. var. ***breviglumis*** (Scribn.) Beetle, Univ. Wyoming Publ. 13:23. 1948. *A. geminiflorus breviglumis* Scribn., Zoe 4:386. 1894. *A. breviglumis* (Scribn.) Nash. Spikelet clusters (branches of inflorescence) 2.5–3 mm long excluding awns; one spikelet of cluster sessile or short-pedicel. *Lemma awn* of perfect spikelet usually 3–4 times as long as membranous base.



Fig. 56. *Spartina foliosa*: panicle, spikelet. From Hitchcock, 1935.

Mexico to Colombia and Venezuela, in moist open or forested sites, often in fertile loamy soils. BAJA CALIFORNIA SUR: Mountains of Cape region, mostly at 700–1650 m: La Laguna, Sierra de la Laguna; Saucito (*Brandegge* in 1893, the type collection); Sierra San Francisquito; El Taste.

It is possible that some of the Baja California specimens should be referred to *A. cenchroides* var. *cenchroides*. In the typical variety, the nerves of the neuter or staminate spikelets extend into an awn not more than twice as long as the body, and the spikelet clusters are 3–4 mm long. In var. *breviglumis* the awns of the staminate or neuter spikelets are 3–4 times as long as the body, and the spikelet cluster is 2.5–3 mm long.

2. ***Aegopogon tenellus*** (DC.) Trin., Gram. Unifl. 164. 1824. Fig. 55. Spikelet clusters mostly 3–4 mm long excluding awns; all spikelets with well-developed pedicels. *Lemma awn* of perfect spikelet usually longer, rarely shorter, than body of lemma.

In the same habitats and at the same elevations as *A. cenchroides* var. *breviglumis*. BAJA CALI-

FORNIA SUR: Cape region: La Laguna, Sierra de la Laguna (Jones 27647).

57. *Spartina* Schreb. ex Gmel.

1. *Spartina foliosa* Trin., Mem. Acad. Imp. Sci. St.-Petersbourg, Ser. 6, Sci. Math. 4:114. 1840. *S. leiantha* Benth., Bot. Voy. Sulphur 56. 1844. Fig. 56. Coarse perennial with tough fibrous leafy culms mostly 70–100 cm tall from spreading rhizomes. *Sheaths* crowded, longer than culm internodes. *Ligule* a short ring of hairs fused together at base. *Blades* long, firm, glabrous, flat or folded, 5–10 mm broad at base, the margins scaberrulous. *Inflorescence* of usually 10 to many erect-appressed spicate branches, floriferous to base with sessile laterally compressed awnless 1-flowered spikelets, the lower branches 4.5–7 cm long. *Glumes* large, slightly unequal, the second as long as or longer than lemma. *Lemmas* usually 8–10 mm long, broadly acute, glabrous except for sparsely ciliate margins. *Paleas* ca. as long as lemmas.

Abundant at low levels in coastal salt marsh, northern California to southern Baja California. BAJA CALIFORNIA NORTE: W coast (Ensenada; Estero Punta Banda; Bahía San Quintín; Laguna Manuela). BAJA CALIFORNIA SUR: W coast from Laguna Scammon to Bahía Magdalena and Isla Magdalena; E coast in vicinity of La Paz.

The type of *S. leiantha* was collected by Barclay at Bahía Magdalena.

58. *Hilaria* H.B.K.

Perennials, mostly rhizomatous or stoloniferous. *Leaves* basal or well-distributed on culms, usually short, flat or involute. *Ligule* a lacerate, often ciliate, membrane. *Inflorescence* a slender dense bilateral spike, the spikelets in clusters of 3 to each node of zigzag rachis, the cluster deciduous as a whole. *Spikelets* of cluster dissimilar, the 2 lateral ones 2-flowered, staminate, the central one 1-flowered, perfect. *Glumes* firm, flat, few- to several-nerved, usually asymmetrical and often bearing awn from one side about middle. *Lemmas* thin, 3-nerved, awned or awnless. *Paleas* about as large as lemmas and similar in texture.

1. Culm internodes woolly-pubescent, at least near base of plant 2. *H. rigida*
1. Culm internodes not woolly-pubescent.
2. Plants with stout culms from thick scaly rhizomes; stolons not developed 1. *H. mutica*
2. Plants with slender culms from tufted, non-rhizomatous base, with or without wiry stolons.
3. Glume awns of lateral spikelets not hispid-ciliate.

4. Spikelets light-colored; spikes mostly 4–5 (–6) mm thick; plants without stolons 3. *H. belangeri* var. *longifolia*
4. Spikelets dark brown, purple, or black; spikes mostly 6–9 mm thick; plants usually developing long looping stolons 4. *H. cenchroides*
3. Glume awns of lateral spikelets (at least some) coarsely hispid-ciliate; spikelets light colored, often tinged with pale violet 5. *H. ciliata*

1. *Hilaria mutica* (Buckl.) Benth., J. Linn. Soc., Bot. 19:62. 1881. *Pleuraphis mutica* Buckl. ZACATE TOBOSO, TOBOSO COMÚN, TOBOSO. Rhizomes thick and usually much-branched. *Culms* firm and tough, glabrous or scabrous-puberulent at nodes, mostly 30–70 cm tall, forming large clumps or sod. *Leaves* glabrous or with few long hairs. *Ligule* 1 mm or less long. *Blades* firm, often involute, 2–4 (–5) mm broad. *Spikes* mostly 4–8 cm long and 6–8 mm thick, with usually 8–25 sessile spikelet clusters. *Spikelet clusters* 6–9 mm long, with tuft of hairs at base. *Glumes* of lateral spikelets broadened upward to fan-shaped, rounded, or truncate apex, ciliate on margins, the medial glumes with lateral scabrous or hairy awn 0.5–3 mm long. *Glumes* of central spikelet narrow, usually short, irregularly cleft, with awn-tipped nerves. *Lemmas* thin, entire or irregularly erose at apex, often minutely awn-tipped. *Anthers* 3–4 mm long.

On dry sandy or rocky slopes and plains, Texas to Arizona and northern Mexico. BAJA CALIFORNIA SUR: Near summit of Cerro Teombo, Sierra de la Giganta, 1065 m (Carter 5070).

2. *Hilaria rigida* (Thurb.) Benth. ex Scribn., Bull. Torrey Bot. Club 9:86. 1882. *Pleuraphis rigida* Thurb. BIG GALLETA. Fig. 57. Culms stout, usually in large clumps, mostly 35–100 cm tall, hard and rhizomatous at base. *Sheaths* rounded, woolly-pubescent or glabrous. *Ligule* a short ring of soft hairs. *Blades* firm, usually involute, glabrous or woolly-pubescent. *Spike* mostly 4–10 cm long and 6–9 mm thick. *Spikelet clusters* 7–10 mm long, densely long-hairy at base. *Glumes* of lateral spikelets ciliate, broad and notched or lobed at apex, several-nerved, with 1–3 nerves extending into short awns. *Glumes* of central spikelet narrow, ciliate. *Lemma* thin, papery, ciliate, that of central spikelet 2-lobed, often short-awned.

Southern Utah, Nevada, and California, to Arizona, Sonora, and Baja California, on dry rocky or sandy foothills and plains mostly below 1000 m. BAJA CALIFORNIA NORTE: Common in the desertic NE: E slope of Sierra Juárez; Sierra de los Cucapás; Cerro del Borrego; S of San Felipe.

3. *Hilaria belangeri* (Steud.) Nash var. *longifolia* (Vasey) Hitchc., Proc. Biol. Soc. Wash. 41:162. 1928. CURLY MESQUITE. Low tufted perennial with slender erect floriferous culms mostly 10–30 cm tall in small clumps. *Culm nodes*, especially lower ones, often densely bearded. *Ligule* a short lacerate membrane. *Blades* short, flat or involute, 1–2 (–3) mm broad, often sparsely pilose. *Spikes* mostly 2–3.5 cm long, well-exserted on slender, nearly filiform, peduncles, with usually 4–8 spikelet clusters. *Spikelet clusters* usually 4.5–6 mm long. *Glumes* of lateral spikelets pale, scabrous, united below, the outer glume slightly broadened above, notched or lobed, the inner shorter and narrower; both frequently mucronate. *Glumes* of central spikelet glabrous or scabrous, slightly broadened above, with scabrous awn mostly 2.5–5 mm long. *Lemmas* thin, narrowed above, awnless.

Texas to Arizona and northern Mexico, on dry hillsides and grassy plains; in Baja California to 1200 m. BAJA CALIFORNIA SUR: San Julio, Sierra San Francisco (*Brandegee*); La Purísima (*Brandegee*); Sierra de la Giganta (*Carter 4170, 5029, 5213*).

The typical variety of *Hilaria belangeri* characteristically develops long looping stolons.

4. *Hilaria cenchroides* H.B.K., Nov. Gen. Sp. 1:117. 1816. TOBOSO MENUDO. Plants usually with wiry creeping or looping stolons. *Erect culms* slender, mostly 6–30 cm tall, usually with bearded nodes. *Sheaths* glabrous or with few hairs on collar. *Ligule* a lacerate membrane usually 1–2 mm long. *Blades* glabrous or sparsely hirsute, flat or folded, 2–5 mm broad. *Spikes* mostly 2–5 cm long and with 5–10 spikelet clusters. *Spikelet clusters* 5–6 mm long, often nearly as broad as long. *Glumes* firm or hard at base and fused together below, smooth or finely scabrous, thickly beset with small dark glands, variously lobed and short-awned.

Baja California, Durango, and San Luis Potosí, to Guatemala, on dry grassy or brushy hills. BAJA CALIFORNIA SUR: Open volcanic south slope, Cerro la Laguna, Sierra San Francisco, 1340 m (*Moran 23839*). Swallen (1964:267) reported this species from Comondú, but his report may be based on *Shreve 7120*, referred here to *H. ciliata*.

5. *Hilaria ciliata* (Scribn.) Nash, N. Amer. Fl. 17(2):136. 1912. *H. cenchroides* H.B.K. var. *ciliata* Scribn. Stoloniferous perennial generally similar to *H. cenchroides*, but culms to 60 cm tall, glumes without dark-colored glands, and lateral awns or narrow lobes of lateral spikelets of cluster usually coarsely scabrous or hispid.



Fig. 57. *Hilaria rigida*: plant; 1, perfect spikelet; 2, staminate spikelet; 3, spikelet cluster. From Gould, 1951.

Southern, central, and western Mexico, on brushy or open rocky slopes, in sandy, clayey, or volcanic soils at low to moderately high elevations. BAJA CALIFORNIA SUR: NE of Comondú (*Shreve 7120*); Cerro Gabilán, Sierra de la Giganta, 1250 m (*Carter 5113*); E of Dátil (*Wiggins 6104*).

Tribe 12. Zoysieae

59. *Tragus* Hall.

1. *Tragus berteronianus* Schult., Mant. 2:205. 1824. ABROJO ESPIGADO, SPIKE BURGRASS. Fig. 58. Low annual with weak usually geniculate-erect culms 5–30 (–40) cm long. *Ligule* a hyaline membrane fringed with short soft hairs. *Blades* short, flat or folded, 1.5–5 mm broad, usually with whitish coarsely hispid margins. *Inflorescence* contracted, cylindrical, mostly 4–12 cm long and 5–7 mm thick, with many bristly burs closely placed on stout puberulent axis. *Burs* of 2–5 spikelets on short rachis, the uppermost usually reduced or rudimentary. *Spikelets* 1-flowered. *First glume* thin, small or absent. *Second glume* of lower 2 spikelets large and firm, bearing three rows of stout hooked spikes. *Lemmas* of lower spikelets thin and flat.



Fig. 58. *Tragus berteronianus*: plant, spikelet cluster. From Gould, 1951.

An Old World grass now widespread in warmer parts of the Americas, a weed of disturbed soils, usually in sandy sites. BAJA CALIFORNIA SUR: Mostly below 700 m: Sierra de la Giganta between Loreto and San Javier; La Paz; El Triunfo; N of Todos Santos; N of Cabo San Lucas.

Tribe 13. Aeluropodeae

60. *Monanthochloë* Engelm.

1. *Monanthochloë littoralis* Engelm., Trans. Acad. Sci. St. Louis 1:437. 1859. SHORE GRASS. Fig. 59. Low mat-forming dioecious perennial with decumbent much-branched stoloniferous culms and with unisexual spikelets borne on short branches in axils of fascicled leaves. *Erect floriferous branches* commonly 8–15 cm tall. *Leaves* mostly clustered and distichous on short lateral shoots and at main branch tips. *Sheaths* rounded, glabrous or puberulent at base, mostly 0.4–0.6 mm long. *Ligule* a minute ciliate membrane. *Blades* firm, thick, sharp-pointed, usually folded or involute, 1–2 (–3) mm broad, seldom over 1 cm long. *Spikelets* 3–5-flowered, borne singly in leaf axils and 1 to few per branch. *Glumes* absent. *Lemmas* rounded on back,



Fig. 59. *Monanthochloë littoralis*: plant, pistillate spikelet (upper), staminate spikelet. From Gould and Box, 1965.

several-nerved, those of pistillate spikelets like leaf blades in texture. *Palea* 2-nerved, about as long as lemma.

Along the coast on saline flats and in marshlands, southern California, Texas to Florida, Cuba, and the northern half of Mexico. BAJA CALIFORNIA: Abundant the length of the peninsula on both coasts, wherever suitable habitats occur; Islas San Martín, Ángel de la Guarda, Rasa, Santa Catalina, San José, San Francisco, and Espíritu Santo.

61. *Distichlis* Raf.

Low to moderately tall dioecious perennials with stout creeping rhizomes and short overlapping 2-ranked leaves. *Culms* tough, firm, many-noded, the nodes glabrous. *Blades* firm, flat or involute, sharp-pointed. *Inflorescence* a contracted panicle or spike-like raceme, with relatively large several-flowered awnless spikelets. *Spikelets* unisexual, the staminate and pistillate similar except for exerted anthers and stigmas. Disarticulation above glumes and between florets. *Glumes* firm, 3–9-nerved, nearly equal, awnless. *Lemmas* similar to glumes

but longer and broader, faintly 5–11-nerved, laterally compressed and keeled, acute at apex.

1. Lemmas 3–6 mm long; leaves usually with a few long stiff hairs laterally on upper margins of sheath at junction with blade 1. *D. spicata*
1. Lemmas 8–15 mm long; leaves usually with tufts of line woolly hairs laterally at junction of sheath and blade 2. *D. palmeri*

1. ***Distichlis spicata*** (L.) Greene, Bull. Calif. Acad. Sci. 2:415. 1887. ZACATE SALADO, SALT GRASS. Fig. 60. Erect culms mostly 10–60 cm tall, in tufts or decumbent-erect from stout creeping many-noded rhizomes or stolons. *Leaves of rhizomes*, and often basal leaves of culms, scale-like. *Sheaths* rounded on back, glabrous or puberulent. *Ligule* a minute membranous collar. *Blades* commonly 1–4 mm broad and 2–8 (–20) cm long, involute on drying. *Inflorescence* usually 2.5–8 cm long, the pistillate generally more congested and irregular than the staminate. *Spikelets* mostly 5–15-flowered and 6–18 mm long. *Paleas* large, the 2 nerves slightly to strongly keeled.

Coastal salt marshes and saline and alkaline places of coast and interior, widespread in North and South America. BAJA CALIFORNIA NORTE: Common in salt marshes and flats along W coast; occasional in interior (e.g. Vallejos, 440 m; Valle Ojos Negros, 680 m), to 1600 m in Sierra Juárez (e.g. Laguna Hanson; Rancho Calabozo) and to 900 m in Sierra San Pedro Mártir (San Isidoro); Islas San Martín and Cedros. BAJA CALIFORNIA SUR: W coast to Bahía Magdalena; E coast to La Paz.

For the variable *D. spicata* Beetle (1943) recognized 7 varieties in North America. In his recent listing of Mexican grasses (Beetle, 1977a:346), he cited two of these and implied a third for Baja California. According to his 1943 paper, these differ as follows:

D. spicata var. *divaricata* Beetle. Culms 1–4 dm tall, stiffly erect; leaf blades divaricate, rigid, rarely more than 5 cm long; spikes rarely congested, the pedicels visible; pistillate spikelets 5–12-flowered. Coastal or interior.

D. spicata var. *stolonifera* Beetle. Culms to 3 dm long, usually prostrate, often stoloniferous; leaf blades erect, lax, mostly 1–2 dm long; spikes congested, the short pedicels hidden; pistillate spikelets 5–9-flowered. Mostly coastal.

D. spicata var. *stricta* (A. Gray) Beetle. Fig. 60. Culms 1–3.5 dm tall, mostly erect; leaves ascending, lax, the blades 1–2 dm long; spikes rarely congested; pistillate spikelets 5–20 flowered. Interior.

2. ***Distichlis palmeri*** (Vasey) Fassett ex I. M. Jtn., Proc. Calif. Acad. Sci., Ser. 4, 12:984. 1924. *Uniola*



Fig. 60. *Distichlis spicata* var. *stricta*: plant, spikelet, floret. From Gould, 1951.

palmeri Vasey. WILD-RICE. Culms stout, coarse, 25–60 or more cm tall, from thick scaly rhizomes. *Blades* mostly 3–5 mm broad at base and 4–12 cm long. *Inflorescence* tightly contracted, 6–20 cm long, the lower branches of staminate inflorescences to 8 cm long, those of pistillate all short. *Spikelets* mostly 7–9-flowered, the staminate 1.5–2 cm long, the pistillate usually 2.5–3 cm long. *Lemmas* acuminate, sharp-pointed, the lowermost usually ca. 1.5 cm long.

In coastal salt marshes of eastern Baja California and NW Sonora, often forming large dense stands. BAJA CALIFORNIA: E coast from mouth of Río Colorado to La Ribera, SE of La Paz; Islas Ángel de la Guarda, Coronados, Carmen, Danzante, Santa Catalina, San José, San Francisco, and Espíritu Santo.

This is a grain plant formerly important to the Cocopa people: quoting from several sources, Castetter and Bell (1951:192–194) told of the annual harvest in late April and early May, at an otherwise lean period in their food cycle. Dr. Edward Palmer, botanical discoverer of the species, reported it



Fig. 61. *Uniola pittiieri*: plant, spikelet, floret. From Swallen, 1955.

abundant in an area 1–20 miles wide along the Río Colorado in the delta area, covering an estimated forty to fifty thousand acres. Many Cocopa came to camp there each season. From rafts, or walking in the mud at low water, they cut the stems while the grain was still slightly green and took them ashore to dry in the sun or with a fire before threshing. Later, when the grain was ripe, they would harvest by knocking it into a basket-tray held by a cord around the neck. Many grains that fell in the water were gathered where they washed up in windrows on the shore. The grain was carried home in bags or in nets lined with straw. For use, it was ground and made into a mush.

62. *Jouvea* Fourn.

1. *Jouvea pilosa* (Presl) Scribn., Bull. Torrey Bot. Club 23:143. 1896. Rhizomatous dioecious perennial with coarse much-branched culms forming clumps 1 m or more wide. *Leaves* thick and tough. *Sheaths* short, broad, rounded on back, with thin membranous margins. *Ligule* a dense ring of hairs

0.5–1 mm long. *Blades* 4–15 cm long, 2–5 mm broad, folded or involute, spine-tipped. *Pistillate inflorescences* few to several in axils of reduced upper leaves, each of 2–4 fascicled spikelets or a solitary spikelet. *Pistillate spikelets* with 1–3 florets embedded in thick spongy rachilla, only the terminal floret free. *Staminate inflorescences* more or less elongated few-flowered spikes or panicles aggregated at branch tips in contracted clusters. *Staminate spikelets* awnless, with 8–20 or more rather loosely imbricated florets. *Glumes* of staminate spikelets 1–3-nerved, similar to and only slightly shorter than the thin 3-nerved lanceolate lemmas. *Paleas* of staminate florets nearly as long as lemmas but narrower.

On sandy beaches, western Mexico to El Salvador. BAJA CALIFORNIA SUR: Cape region (near La Paz; Todos Santos; Migrño; San José del Cabo; Cabo San Lucas); Islas Coronados, Carmen, Danzante, Monserrate, Santa Catalina, San José, San Francisco, Espíritu Santo, and Cerralvo.

Tribe 14. Uniolaeae

63. *Uniola* L.

1. *Uniola pittiieri* Hack., Oesterr. Bot. Z. 52:309. 1902. Fig. 61. Stoloniferous perennial with culms to 2 m tall. *Lower leaves* distichous. *Sheaths* ciliate with long white hairs and these forming tufts just below collar, glabrate in age. *Blades* long, firm, to 15 mm broad, involute on drying. *Inflorescence* a contracted panicle 10–44 cm long of large awnless spikelets. *Spikelets* short-pedicelled, 6–24-flowered, 8–25 mm long, 6–11 mm broad. Lower 2–6 florets of spikelet neuter, the upper bisexual. *Glumes* firm, subequal, 1.5–6 mm long, acute to slightly bifid or mucronate. *Lemmas* firm, 3–7- (–9-) nerved, acute to slightly mucronate, the margins ciliate to ciliate. *Paleas* shorter than lemmas. *Anthers* 2–3 mm long. *Caryopsis* narrow, ca. 1.5 mm long.

On sandy beaches, Sonora to Ecuador. Both Hitchcock (1913:370) and Yates (1966:379) cited a specimen (*Dewey in 1874*) from Baja California without exact locality. Presumably this was Comdr. George Dewey of the U.S.S. *Narragansett*, who surveyed the shores of Baja California in 1874 and 1875 but also visited mainland Mexico. We have seen no other collections attributed to Dewey, though Surgeon Thomas Hale Streets of the *Narragansett* made a "small but interesting collection of plants" (Gray, 1877:162). Since this conspicuous grass apparently has not since been found in Baja California, the source of the Dewey specimen remains doubtful.

Tribe 15. Pappophoreae

64. *Pappophorum* Schreb.

1. *Pappophorum vaginatum* Buckl., Prelim. Rep. Geol. Agr. Surv. Texas, App. 1, 1866. *P. mucronulatum* auth., not Nees. BARBÓN PUNTIAGUDO, Fig. 62. Perennial with culms 30–80 cm tall, glabrous, erect or geniculate below. *Sheaths* with tuft of long hairs on each side of collar, the hairs deciduous in age. *Ligule* a ring of short hairs, but base of blade immediately above ligule with hairs 2–4 mm long. *Blades* flat or involute, scabrous, 10–20 (–30) cm long, 1.5–5 mm broad. *Panicle* narrow, tightly contracted, whitish or tawny, rarely purple-tinged, mostly 12–25 cm long. *Spikelets* with 1, rarely 2, perfect florets and 2 reduced florets above; disarticulation above glumes. *Glumes* subequal, thin, membranous, 1-nerved. *Lemmas* firm, rounded on back, indistinctly many-nerved, the nerves extending into 11 or more unequal glabrous or scabrous awns. *Body of lowermost lemma* 3–4 mm long. *Palea* about as long as body of lemma.

Texas to southern Arizona and northern Mexico. BAJA CALIFORNIA SUR: Wiggins (1980:919) reported *P. mucronulatum* Nees “on grassy plains and valley floors, introduced into S.B.C.”. That is a South American species whose name has long been used for *P. vaginatum*. We have seen no Baja Californian specimens of *Pappophorum*.

65. *Enneapogon* Desv. ex Beauv.

1. *Enneapogon desvauxii* Beauv., Ess. Agrost. 82, 161, 1812. *P. wrightii* S. Wats. ZACATE LADERA, FEATHER PAPPUSGRASS, Fig. 63. Low tufted perennial with slender wiry often geniculate culms 10–50 cm tall. *Culms* pilose, at least on nodes. *Ligule* a ring of soft hairs ca. 1 mm long. *Blades* filiform, hispid, mostly 2–12 cm long and 0.5–2 mm broad, folded or involute on drying. *Inflorescence* a contracted bristly panicle mostly 2–9 cm long and 6–10 (–15) mm thick, grayish or lead-colored. *Spikelets* commonly 5–7 mm long including awns, usually 3-flowered with only lower floret perfect. *Glumes* thin, puberulent, subequal, the first 5–7-nerved, the second 3–4-nerved. *Lemmas* shorter than glumes, broad, pubescent, with rounded back, the body mostly 1.5–2 mm long, with 9 nerves and 9 equal plumose awns 3–4 mm long. *Palea* about as long as body of lemma, with widely divergent nerves.

Occasional on dry open slopes. Utah to Texas, Arizona, and Mexico; also Bolivia, Peru, and Argentina. In Baja California at 100–1650 m. BAJA CALIFORNIA NORTE: Rare in the NW (SSE of El



Fig. 62. *Pappophorum vaginatum*: plant, spikelet, perfect floret. From Hitchcock, 1935.

Rodeo, 1040 m); Punta Prieta; Bahía de los Ángeles; Sierra San Borja; Calmallí. BAJA CALIFORNIA SUR: S of El Arco; La Tinaja, E of Picachos de Santa Clara; Cerro Azufre; Volcán las Tres Vírgenes; Sierra de la Giganta; La Paz.

Tribe 16. Orcuttieae

66. *Orcuttia* Vasey

Low tufted viscid and odorous annuals, with short usually unbranched culms ending in spikelike racemes of large many-flowered spikelets. *Leaf* division into sheath and blade often marked only by a slight constriction, the blade broad at base and gradually tapering to point. *Ligule* usually not evident. *Spikelets* with upper florets reduced and neuter. *Glumes* subequal, entire or 2–5-toothed. *Lemmas* strongly several-nerved, irregularly toothed and short-awned at apex. *Paleas* about as long as



Fig. 63. *Enneapogon desvauxii*: plant, spikelet, spikelet without glumes. From Gould, 1978.

lemmas, with 2 green keels. *Caryopsis* laterally flattened, with large basal hilum.

- | | | |
|---|-------|--------------------------|
| 1. Glumes, at least the first, toothed, 2–4 mm long | ----- | 1. <i>O. californica</i> |
| 1. Glumes acuminate, not toothed, ca. 7 mm long | ----- | 2. <i>O. fragilis</i> |

1. ***Orcuttia californica*** Vasey, Bull. Torrey Bot. Club 13:219. 1886. Fig. 64. *Culms* numerous in the tuft. 5–20 cm long, usually pilose on and below nodes. *Sheaths* and *blades* thin, similar in texture, pilose, the hairs often papillate at base. *Blades* mostly 2–4 cm long and 1.5–3 mm broad. *Inflorescence* 2–5 cm long, more or less viscid-glandular, with usually 3–8 densely to sparsely pilose spikelets appressed-erect on short, stout pedicels. *Spikelets* mostly 0.8–2 cm long, with usually 8–16 or more florets. *Glumes* narrow to broad, coarsely 3–5-toothed, shorter than lemmas. *Lemmas* mostly 4–5 mm long, with usually 11–15 nerves; deeply toothed at apex, the teeth often short-awned.

Rare in southern California and NW Baja California, in a few vernal pools and now a few roadside ditches, at low elevations. BAJA CALIFORNIA NORTE: vernal pools, since destroyed, Tijuana airport (Moran 16053, 16113, 16125); abundant in large vernal ponds, mesa N of Cabo Colnet [Cape Colnett] (Moran 27576, 27591, 27611); local in borrow pits by highway SE (and \pm down wind) of Cabo



Fig. 64. *Orcuttia californica*: plant, lemma, palea, spikelet. From U.S.D.A. Bull. No. 7.

Colnet, S of Colnet (village) (Moran 26281) and near Ejido Ruben Jaramillo (Moran 23508); near Bahía San Quintín (*Orcutt* 1439, the type collection).

2. ***Orcuttia fragilis*** Swallen, J. Wash. Acad. Sci. 34:308. 1944. Low tufted annual, similar to *O. californica* but culms to 40 cm long, blades mostly 6–12 mm broad, spikelets 3–8-flowered, glumes entire, acuminate, the upper lemmas successively smaller, minutely toothed and mucronate.

Endemic to the Magdalena Plain of southern Baja California, in the bed of a shallow sometimes lake that is more often a dry plain, abundant in years of good rainfall and absent other years. BAJA CALIFORNIA SUR: Known only from Llanos de Hiray, Llanos de Magdalena, ca. 20 m (*Gentry* 4192, the type collection; *Griggs s.n.*; *Reeder & Reeder* 7131, 7155, &c.).

The type locality was given originally as "Llano Dirai" and by Swallen (1964:249) as "Llano Datil-

lare", but according to Reeder (1981) it is "Llanos de Hiray".

Howard Gentry discovered this grass in January 1939 and reported it abundant over the great flood-plain following rain storage. In January 1977 Tom Griggs found only old dried plants; he collected seeds and raised them at Davis, California, that spring (letter and specimen to Moran, October 1980). John and Charlotte Reeder (1980) told of visiting Llanos [=plains] de Hiray several times from 1974 to 1978 and finding them dry and parched, with little herbaceous vegetation and no living *Orcuttia*. In May 1979, in a year of good rainfall, they found an essentially pure stand of *Orcuttia* in flower over hundreds of acres. And in early June 1980 they found the Llanos under water and the *Orcuttia* forming an unbroken greensward on the margins.

Gentry's label called this a forage grass, reported excellent for cattle. In May 1979 the Reeders thought that grazing animals seemed to avoid it if anything else was available; but in June 1980, when there was little else, they found cattle eating it.

Tribe 17. Aristideae

67. *Aristida* L.

Low to moderately tall caespitose annuals and perennials, without rhizomes or stolons. *Blades* elongate, narrow, often involute. *Ligule* a ring of hairs or a minute ciliate membrane. *Inflorescence* an open or contracted panicle of usually large awned 1-flowered spikelets. Disarticulation above the usually large lanceolate, 1- (-3-) nerved glumes. *Lemmas* terete, indurate, 3-nerved, with hard sharp-pointed callus at base and rounded awn column at apex usually bearing 3 awns, the lateral awns totally or partially reduced in a few species. *Caryopsis* long and slender, permanently enclosed by firm lemma and thin palea.

1. Awn column jointed at base, disarticulating with slight pressure at maturity.
 2. Culm internodes pubescent 1. *A. californica*
 2. Culm internodes glabrous 2. *A. glabrata*
1. Awn column not jointed at base, persistent.
 3. Plants annual 3. *A. adscensionis*
 3. Plants perennial.
 4. Lateral awns absent or reduced, rarely over 2 mm long.
 5. Awn column strongly twisted 4. *A. schiediana*
 5. Awn column not or only slightly twisted.
 6. Awn usually 15-20 (7-30) mm long, more or less arcuate but not recurved with a semicircular bend 5. *A. ternipes*
 6. Awn usually about 8 mm long, recurved and with a semicircular bend 7. *A. purpusiana*
 4. Lateral awns present, more than 2 mm long.
 7. Panicle open or loose, at least the lower branches spreading A

7. Panicle contracted, the branches usually all appressed along main axis AA

A (Panicle open)

8. Main panicle branches stiffly spreading, often widely so; awns not more than 2.5 cm long.
 9. Pedicels and branchlets mostly appressed, the latter without calluses in their axils.
 10. Awn column not or only slightly twisted, usually short and stout 6. *A. hamulosa*
 10. Awn column strongly twisted, usually slender and long 8. *A. divaricata*
 9. Pedicels and branchlets mostly spreading, the latter usually with calluses in their axils 9. *A. barbata*
8. Main panicle branches slender, at least some curving in a "U" or "S" shape under weight of mature spikelets, mostly 1-4 cm long; awns mostly 4-8 cm long 14. *A. longiseta*

AA (Panicle contracted)

11. Lemma tapering to a slender, usually twisted awn column 3-6 mm long.
 12. Glumes equal or nearly so, the second mostly 13-18 mm long; leaf blades narrow, flat or folded, the lower ones usually flat and often curled 11. *A. arizonica*
 12. Glumes unequal, the second mostly 10-14 mm long, often twice as long as the first; blades strongly involute 12. *A. glauca*
11. Lemma at maturity thick nearly to base of awns, not or only slightly twisted above.
 13. Second glume typically 16-25 mm long; awns usually 4-10 cm long 14. *A. longiseta*
 13. Second glume typically 15 mm or less long; awns 3.5 cm or less long.
 14. Blades mostly 10-20 cm long, not in a conspicuous basal tuft 10. *A. wrightii*
 14. Blades 10 cm or less long in a conspicuous basal tuft 13. *A. fendleriana*

1. *Aristida californica* Thurb. ex S. Wats., Bot. Calif. 2:289. 1880. *A. peninsularis* Hitchc., Contr. U.S. Natl. Herb. 22:521. 1924. Tufted perennial (often appearing annual), with freely branched culms mostly 15-50 cm long, at least the lower internodes finely and densely puberulent. *Sheaths* mostly much shorter than internodes. *Blades* filiform, involute, mostly 1-2 mm broad. *Inflorescence* a few-flowered contracted raceme with large long-awned spikelets on short appressed pedicels, each plant with many inflorescences terminating the many wiry branches. *Glumes* unequal, the second mostly 10-16 mm long, the first ca. half as long. *Lemmas* articulate with the awn column, the body mostly 5-7 mm long, purple or mottled bluish-purple at maturity, densely pubescent on callus with stiff hairs. *Awn column* slender, light-colored, loosely twisted, 1.5-2 (-2.5) mm long. *Awns* mostly 2.5-4.5 cm long, the three awns ca. equal.

On dry sandy open or brushy plains, mostly at 5-50 m, SE California, SW Arizona, Baja California,

and Sonora. BAJA CALIFORNIA NORTE: In desert parts (e.g. San Quintín; Puertocitos; Punta Prieta; Bahía de los Ángeles); Islas Ángel de la Guarda and San Lorenzo. BAJA CALIFORNIA SUR: Widespread, most frequent in coastal sands.

Aristida peninsularis was based on a specimen collected November 1887 by Edward Palmer (No. 501) on sandy beaches at Los Angeles Bay [Bahía de los Ángeles]. It was said to differ from *A. californica* in being annual and in having larger glumes (the first ca. 1 cm, the second ca. 2 cm long), larger lemmas (ca. 8 mm long), and longer awns (3–5 cm long). Because only *A. californica* and no distinct annual plant has since been found at Bahía de los Ángeles, it seems that *A. peninsularis* must be only an annual-appearing form of *A. californica*. *Aristida fugitiva* Vasey in S. Wats. (Proc. Amer. Acad. Arts 24:80. 1889) is a nomen nudum apparently based on the same type.

2. *Aristida glabrata* (Vasey) Hitchc., Contr. U.S. Natl. Herb. 22:522. 1924. *A. californica* var. *glabrata* Vasey, Proc. Calif. Acad. Sci., Ser. 2, 3:178. 1891. Perennial, generally similar to *A. californica* but culm internodes glabrous or scabrous, the lemma awn column mostly 1–1.8 cm long, and the awns mostly 1.5–4 cm long.

Southern Arizona, Sonora, and Baja California, mostly on sandy or gravelly slopes in desert scrub and grassland at low elevations. BAJA CALIFORNIA NORTE: Los Emes, SW flank of Sierra San Pedro Mártir; Bahía San Francisquito. BAJA CALIFORNIA SUR: Bahía Magdalena; Cape region (San Antonio; Eureka; Santiago; Todos Santos; San José del Cabo; Cabo San Lucas). Based on Brandegee collections from Todos Santos and San José del Cabo. *Aristida californica* var. *major* Vasey in Brandegee, nomen nudum (Proc. Calif. Acad. Sci. Ser. 2, 2:213. 1889), based on *Brandegee in 1889* from Isla Magdalena, belongs here according to Hitchcock (1935a:798).

3. *Aristida adscensionis* L., Sp. Pl. 82. 1753. *A. bromoides* H.B.K. TRES ARISTAS DE AGUA, ZACATE DE AGUA TRES BARBAS, SIXWEEKS THREEAWN. Fig. 65. Tufted annual, extremely variable in size, growth habit, and length of life. Culms wiry, often geniculate-spreading and freely branched, mostly 10–50 cm tall. Sheaths much shorter than internodes. Ligules short, densely ciliate-pubescent. Blades flat, folded, or involute, 1–2.5 mm broad. Panicles narrow, contracted, rather dense, mostly 5–15 cm long, the branches short and closely flowered to base. Glumes unequal, the second usually 8–11 mm long, the first shorter. Lemmas 6–9 mm long, usu-

ally scabrous in lines, pubescent on callus, thick to base of awns. Awns about equal, conspicuously flattened at base, 7–15 (–20) mm long, usually not widely spreading even at maturity.

Dry sandy or rocky slopes, plains, and washes, often weedy on disturbed soils, western Missouri, California, and Texas, to Argentina. BAJA CALIFORNIA: Occasional in the NW and common in the deserts, including most of the desert islands.

Beetle (1974) discussed variation in *A. adscensionis* and recognized seven varieties for Mexico. We accept three for Baja California.

1. Culms mostly 30–75 cm tall, often branching above the base; awns (8–) 10–20 mm or more long.
2. Awns flexuous, not reflexed 3a. *A. adscensionis* var. *adscensionis*
2. Awns stiffly reflexed 3b. *A. adscensionis* var. *decolorata*
1. Culms less than 30 cm tall, infrequently branching above the base; awns 1–15 mm long, occasionally completely reduced 3c. *A. adscensionis* var. *modesta*

3a. *Aristida adscensionis* L. var. *adscensionis*. *A. interrupta* Cav. *A. adscensionis* L. var. *interrupta* (Cav.) Beetle. *A. dispersa* Trin. & Rupr. var. *nigrescens* (Presl) Trin. & Rupr. *A. adscensionis* L. var. *nigrescens* (Presl) Beetle. The typical variety of *A. adscensionis* occurs throughout the range of the species, varying considerably in size and general appearance depending on available moisture and on other environmental factors.

3b. *Aristida adscensionis* L. var. *decolorata* (E. Fourn.) Beetle, Phytologia 28(4):317. 1974. *A. grisebachiana* E. Fourn. var. *decolorata* E. Fourn. Beetle (1974) noted "This plant is characterized by its striking habit of producing whorled vegetative branching well above the base".

Endemic to Mexico, occurring on the Yucatan Peninsula, in Oaxaca, and most commonly in Baja California Sur.

3c. *Aristida adscensionis* L. var. *modesta* Hack. in Stuckert, Anales Mus. Nac. Hist. Nat. Buenos Aires Ser. 3, 4:89. 1904.

California and Arizona to Argentina, the common variety in the north. BAJA CALIFORNIA: Frequent on sandy sites at low elevations, occasionally on dry mountainsides to 1000 m.

4. *Aristida schiedeana* Trin. & Rupr., Mem. Acad. Imp. Sci. St.-Petersbourg, Ser. 6, Sci. Math. 7:120. 1843. *A. orcuttiana* Vasey, Bull. Torrey Bot. Club 13:27. 1886. Fig. 66. Perennial with culms in small or large clumps, mostly 30–100 cm tall, branched only at base. Sheaths rounded or basal ones becoming flattened. Ligule a dense fringe of short hairs. Blades elongate, 1–3 mm broad, the lower



Fig. 65. *Aristida adscensionis*. From Hitchcock, 1935.

often flat, the upper usually becoming involute. *Panicles* open, mostly 15–30 cm long, with slender flexuous branches, the lower usually widely spreading or deflexed at maturity and often bare of spikelets below middle. *Branchlets* and spikelets more or less appressed along main branches. *Glumes* glabrous or scabrous-pubescent in lines, the second usually 8–15 mm long, the first about $\frac{2}{3}$ to as long. *Body of lemma* mostly 6–9 mm long, dark violet or blotched with violet. *Awn column* scabrous, tightly twisted, mostly 2–4 mm long. *Lateral awns* absent or to 1 (–2) mm long. *Central awn* sharply divergent, mostly 6–13 mm long.

Dry rocky and often brushy hills and desert grasslands, western Texas to southern California and through Mexico to Guatemala. BAJA CALIFORNIA NORTE: Sierra Juárez: Cerro el Topo, 1700 m (*Moran* 15593); Hansen's Ranch [Laguna Hanson, 1600 m] (*Orcutt* 507); Sierra San Pedro Mártir: Cañón del Diablo, 1165 m (*Chambers* 636); Arroyo la Grulla, 1900 m (*Moran* 24418, 24480); Santa Rosa, 2050 m (*Moran & Thorne* 14406). BAJA CALIFORNIA SUR: Cape region: La Chuparosa (*Brandegee* in 1897); Sierra San Francisquito (*Brandegee* in 1899); Isla Espíritu Santo (*Wiggins* 15248, 19111).



Fig. 66. *Aristida schiedeanae*: plant, panicle, spikelet with floret separated from glumes. From Gould, 1951.

Hitchcock (1935a, 1935b) and Chase (1951) have used the name of *A. orcuttiana* for plants of SW USA and NW Mexico, but there seems to be no consistent basis for distinguishing this entity from *A. schiediana*. The type of *A. orcuttiana* is *Orcutt* 507, from Hansen's Ranch [Laguna Hanson], in the Sierra Juárez.

5. *Aristida ternipes* Cav., Icon. Pl. 5:46. 1799. *A. scabra* (H.B.K.) Kunth. TRES ARISTAS ARQUEADO, SPIDERGRASS. Cespitose perennial with firm stiffly erect culms mostly 40–130 cm tall. *Sheaths* rounded, scabrous. *Ligule* a minute puberulent rim. *Blades* long, narrow, firm, involute on drying, glabrous or hispid on adaxial surface. *Panicles* mostly 10–55 cm long, typically open and with a few long and spreading or drooping branches bare of spikelets on lower $\frac{1}{3}$ – $\frac{1}{2}$ but occasionally with branches remaining short and erect-spreading. *Branchlets* and spikelets conspicuously appressed along primary branches. *Glumes* unequal to nearly equal, scabrous, acute or acuminate, variable in size but second usually 8–14 mm long; first glume early deciduous, the second persistent. *Lemma* scabrous, mottled purple, variable in size and length of awn, the body (to base of lateral awn junction) commonly

7–18 mm long, the awn straight to flexuous, or bent at right angle, (5–) 7–25 mm long. *Lateral awns* often completely suppressed but occasionally as much as 2 mm long.

Western Texas to Arizona and through Mexico; also on islands of the Caribbean and in South America. On dry rocky or sandy, often brushy, slopes and plateaus. BAJA CALIFORNIA SUR: Frequent throughout the state S of Santa Rosalia at 200–1000 m.

6. *Aristida hamulosa* Henr., Meded. Rijks-Herb. 54:219. 1926. Cespitose perennial essentially similar to *A. ternipes* but with lateral awns of lemma well-developed and only slightly shorter than central one. *Central awn* typically 14–25 mm long though occasionally shorter.

On dry rocky slopes in desert grasslands and scrub areas and in open forest at higher elevations, southern California to western Texas and Guatemala. BAJA CALIFORNIA NORTE: Sierra Juárez, 1000–1225 m (La Hechicera; Agua Flores; El Rodeo); Arroyo el Picacho, Sierra San Pedro Mártir, 1525 m; Valle de San Juan, Sierra San Borja, 1100 m.

7. *Aristida purpusiana* Hitchc., Contr. U.S. Natl. Herb. 17:276. 1913. Description from Hitchcock (1935b:383): “Plants perennial; *culms* erect, slender, rigid, glabrous, 50–60 cm high, the branches stiffly ascending; *sheaths* glabrous, pilose at the throat; *blades* 1–2 mm wide, 5–10 cm long, becoming involute; *panicle* narrowly pyramidal, 15–25 cm long, the branches few, short, few-flowered, finally spreading or reflexed, the lower 5–6 cm long, the branchlets and pedicels stiffly ascending; *glumes* somewhat unequal, the first about 6 mm, the second 8 mm long, smooth, 1-nerved, slightly notched at the apex; *lemma* conspicuously pilose at the base, about 1 cm long to base of awns, straight, minutely scabrous on the short beak, the lateral awns scarcely 1 mm long; *terminal awn* about 8 mm long, recurved by a semicircular bend.”

As delimited by Hitchcock (1913, 1935b), confined to the Cape region of Baja California. BAJA CALIFORNIA SUR: San José del Cabo (*Purpus* 394, the type collection; *Brandegee in 1890*; *Beetle M-2607*).

Aristida purpusiana is doubtfully distinct from *A. ternipes*: plants with curved lemma awns are occasional throughout the range of that species. A collection from near Guaymas, Sonora (*Gould 12072*) has stout curved awns, but the plant is almost 1 m tall. Several collections of *A. ternipes* from Yuca-

tán have long curved lemma awns, some semi-circular and some S-curved.

8. *Aristida divaricata* Humb. & Bonpl. in Willd., Enum. Pl. 1:99. 1809. *A. palmeri* Vasey. TRES ARISTAS BARBADO, TRES ARISTAS ABIERTO, POVERTY THREEAWN. Cespitose perennial with slender wiry culms mostly 25–60 cm tall. *Sheaths* rounded, usually with lateral tufts of short hair on collar. *Ligule* a dense fringe of short hairs. *Blades* elongate, mostly 2 mm or less broad, usually involute on drying. *Panicles* mostly 10–30 cm long, the lower branches usually long, widely spreading, and bare of spikelets on lower ½ or ⅓. *Secondary branches and pedicels* appressed along primary branches. *Glumes* subequal, acute to acuminate, mostly 9–14 mm long. *Lemma* with body mostly 5–7 mm long including rather long stiffly bearded callus. *Awn column* twisted, scabrous, usually 2–5 mm long, bearing 3 subequal awns mostly 10–20 mm long.

Kansas to southern California and Texas and through Mexico to Guatemala, on dry rocky often brushy slopes or in open forest, usually at moderately high elevations. BAJA CALIFORNIA NORTE: Sierra Juárez, 700–1450 m; SE of Rancho Mezquite (*Moran 13445*); Rancho Neji (*Wiggins & Gillespie 4144*); Ojos Negros; near Santa Catalina [Santa Catarina] (*Orcutt 1, 2*).

9. *Aristida barbata* E. Fourn., Mex. Pl. 2:78. 1886. *A. havardii* Vasey. TRES ARISTAS BARBADO, HAVARD THREEAWN. Similar to *A. divaricata* but plants usually smaller, the panicles mostly only 6–15 cm long, and the secondary panicle branches and pedicels typically spreading.

Western Texas to Arizona and central Mexico, on rocky or sandy hills and plateaus. BAJA CALIFORNIA NORTE: Near Santa Catarina, Sierra Juárez (*Broder 666*) according to Alan Beetle (letter to Gould).

Hitchcock (1935b:388) wrote: “This species is closely allied to *A. divaricata*, but is distinguished by the hemispheric habit of growth and the flexuous or implicate branches and pedicels. In *A. divaricata* the culms are often prostrate or nearly so but do not form hemispheric tufts; the main branches are naked at base and the pedicels usually appressed along the upper part of the branches. In *A. barbata* the branches are shorter and bear a basal branch, so that the spikelets are evenly distributed through the panicle.”

10. *Aristida wrightii* Nash var. *parishii* (Hitchc.) Gould, J. Arnold Arbor. 60:320. 1979. *A. parishii*

Hitche. Cespitose perennial with stiffly erect culms mostly 35–80 cm tall. *Leaves* glaucous, distributed to well above base. *Sheaths* usually with lateral tufts of hair at apex on each side of collar. *Blades* elongate, firm, usually involute, mostly 1–2 mm broad, scabrous or pilose on adaxial surface. *Panicles* contracted, narrow, elongate, mostly 12–27 cm long, occasionally with rather long stiff and slightly spreading lower branches. *Glumes* rather broad, acute or acuminate, subequal, ca. 12 mm long. *Lemmas* stout, scabrous in lines, mostly 10–15 mm to base of awns, the upper part (awn column) straight or somewhat twisted. *Awns* equal or the central one much longer, mostly 15–30 (–40) cm long.

On dry rocky slopes, Arizona and southern California to Baja California. BAJA CALIFORNIA NORTE: Near Santa Catarina (Wiggins 5333); Pozo Alemán (Wiggins 7837).

Aristida wrightii var. *parishii* differs from var. *wrightii* in its subequal glumes and apparently in a tendency for the panicles to be more densely flowered.

11. *Aristida arizonica* Vasey, Bull. Torrey Bot. Club 13:27. 1886. ARIZONA THREEAWN. Tufted perennial with culms in small clumps, 30–100 cm tall. *Sheaths* glabrous or hairy on upper margins and on each side of collar. *Ligule* a fringe of fine short hairs. *Blades* 1–4 mm broad, flat or folded (lower ones usually flat). *Panicles* 10–25 cm long, contracted, few-flowered, the branches mostly erect-appressed, all short or lowermost to 6 cm long. *Glumes* nearly equal or first slightly shorter, brownish or bronze-tinged, usually narrow at apex and often short-awned; second glume 13–18 mm long. *Lemma* beaded at base, 13–18 mm long to base of awns, with slender twisted awn column 3–6 mm long. *Central awn* usually 2–3.5 cm long and slightly longer than lateral awns; all awns occasionally reduced in length.

Colorado, Texas, and Arizona, to northern Mexico, in dry soil, usually on higher mountain slopes and often in yellow pine forest. BAJA CALIFORNIA NORTE: Sierra San Pedro Mártir: near Vallecitos (Breedlove 16333, Wiggins 16676); Yerba Buena, 2450 m (Moran & Thorne 14190).

12. *Aristida glauca* (Nees) Walp., Ann. Bot. (London) 1:925. 1849. BLUE THREEAWN. Low tufted perennial with culms mostly 15–30 cm tall. *Sheaths* usually with tufts of hair on each side of collar. *Ligule* a minute fringed membrane. *Blades* basally clustered or scattered on culms, typically glabrous

and glaucous, tightly involute and stiffly curved, mostly 1.5 mm or less broad. *Panicles* usually 6–18 cm long, typically narrow and contracted, with tightly appressed branches and spikelets, but occasionally with a few slender spreading lower branches. *Glumes* narrow, acute to acuminate, strikingly unequal, the first $\frac{1}{2}$ – $\frac{2}{3}$ as long as second, the second usually 7–12 mm long. *Lemmas* to base of awns usually 1–3 mm longer than second glume, the slender body tapering into delicate somewhat twisted neck or awn column 1–4 mm long. *Awns* slightly unequal, the middle one usually 15–20 mm long and longer than lateral ones.

On dry slopes and plains, usually at relatively low elevations; Utah and Nevada through Texas, Arizona, and southern California, to central Mexico. BAJA CALIFORNIA NORTE: Sierra Juárez (W of La Rumorosa; SSE of El Rodeo; E of El Milagro); W of Col. Cardenas; Valle el Picacho, Sierra San Pedro Mártir, 1050 m; N of San Felipe; San Agustín; Pozo Alemán; Islas Ángel de la Guarda and San Lorenzo.

13. *Aristida fendleriana* Steud., Syn. Pl. Glum. 1:420. 1855. FENDLER THREEAWN. Low tufted perennial with culms mostly 10–35 cm tall. *Leaves* numerous, short, mostly in dense basal cluster. *Blades* slender, firm, tightly involute, commonly 2–6 cm and seldom over 10 cm long. *Inflorescence* slender, contracted, few-flowered, mostly 3–13 cm long, usually a panicle but often reduced to a raceme with 2–6 spikelets. *Spikelets* mostly appressed to main axis but occasionally some on slender S-curved branches. *Glumes* unequal, the first $\frac{1}{2}$ – $\frac{2}{3}$ as long as second, the second usually 11–15 mm long. *Lemmas* mostly 11–13 mm long to base of awns, glabrous or scabrous in lines, with a short straight or slightly twisted poorly defined awn column. *Lemma awns* widely spreading, the central one mostly 2–3.5 cm long, the lateral ones slightly shorter.

North Dakota and Montana to southern California, Arizona, Texas, and northern Mexico, on dry open sandy or gravelly slopes and flats. BAJA CALIFORNIA NORTE: Often with piñon and juniper or *Artemisia tridentata* and *Arctostaphylos pungens*; Sierra Juárez, 1200–1650 m (Valle los Pinos; between Hechicera and El Condor; S of Los Gavilanes; N of Rancho Viejo); N of El Alamo, 1175 m; Sierra San Pedro Mártir (N of Rancho San Antonio, 1150 m; ex-misión San Pedro Mártir, 1475 m).

14. *Aristida longiseta* Steud., Syn. Pl. Glum. 1:420. 1855. TRES ARISTAS ROJO, RED THREEAWN. Tufted

perennial with slender culms 10–35 (–50) cm tall. *Leaves* in dense tuft at base of plant or well distributed on culms. *Sheaths* with prominent tufts of hairs on each side of collar. *Ligule* a short ciliate membrane. *Blades* firm, glaucous, involute, 2 mm or less broad, frequently not over 8 cm long but occasionally to 15 cm. *Inflorescence* narrow, flexuous or stiffly erect, contracted or rather open and with few to several slender spreading or curved branches. *Spikelets* on short or long pedicels. *Glumes* broad, unequal, the first $\frac{1}{2}$ – $\frac{2}{3}$ as long as second, the second typically 16–25 mm long. *Lemmas* mostly 13–15 mm long to base of awns, thick and straight or slightly twisted above, without a well-defined neck or awn column. *Awns* nearly equal, mostly 3.5–10 cm long.

Throughout western USA and most of northern Mexico, frequent along roadways and ditches, on dry open slopes and flats, and in washes. BAJA CALIFORNIA NORTE: SE of Santa Catarina, Sierra Juárez, 1360 m (Broder 707); in same vicinity (Broder 769, 819).

As reported by Wiggins (1980:887), *Aristida purpurea* Nutt. occurs near El Mármol [Agua Dulce, F. P. Cronmiller 3057]. This is close to *A. longiseta* and apparently intergrades with it but has the second glume mostly 11–15 mm long, the lemma 10–12 mm long, usually scabrous in lines above, and the awns mostly 3.5–4.5 mm long. It occurs from Utah and Kansas to southern California, Arkansas, and northern Mexico.

Subfamily V. PANICOIDEAE

Tribe 18. Paniceae

68. *Digitaria* Heist.

Annuals and perennials with erect or decumbent-spreading culms. *Ligules* membranous. *Inflorescence* a panicle with 2 to several slender spicate branches; these unbranched or, in a few species, sparingly rebranched. *Inflorescence branches* with flat or 3-angled, often winged, rachis, the spikelets subsessile or short-pedicel in 2 rows. *Spikelets* 2-flowered, the lower floret staminate or neuter, the upper perfect; disarticulation below glumes. *First glume* minute or absent. *Second glume* well-developed but usually shorter than lemma of lower floret. *Lemma* of upper floret relatively narrow, acute or acuminate, firm but not hard, the margins thin and flat, not inrolled over palea.

1. Plants perennial; rachis of inflorescence branch not or obscurely winged 1. *D. californica*

1. Plants annual; rachis of inflorescence branch winged, the wings often as broad as body.
2. Branch rachis usually bearing scattered fine hairs; spikelets less than 2.3 mm long 2. *D. horizontalis*
2. Branch rachis without scattered fine hairs; spikelets 2.3 mm or more long.
3. Second glume less than 1.5 mm long; lateral nerves of lemma of lower floret with conspicuous spicules; leaf bases with papilla-based hairs 5. *D. sanguinalis*
3. Second glume more than 1.5 mm long; lateral nerves of lemmas lacking conspicuous spicules; leaf bases with or without papilla-based hairs.
4. Lemma of lower floret of sessile spikelet with lateral nerves crowded to margins; first glume generally more than 0.3 mm long; lateral primary branches usually not all digitate 3. *D. ciliaris*
4. Lemma of lower floret of sessile spikelet with nerves equidistant; first glume less than 0.3 mm long; lateral branches all digitate 4. *D. bicornis*

1. *Digitaria californica* (Benth.) Henr., Blumea 1:99. 1934. *Panicum californicum* Benth., Bot. Voy. Sulphur 55. 1844. *Trichachne californica* (Benth.) Chase. ZACATE PUNTA BLANCA, PLUMERO BLANCO, CALIFORNIA COTTONTOP. Fig. 67. Cespitose perennial with culms mostly 50–100 cm tall from firm knotty base covered with densely pubescent scale leaves. *Blades* of culm leaves mostly 2–12 cm long and 2–5 mm broad, glabrous or sparsely hirsute. *Panicles* narrow, 8–12 (–15) cm long, with short appressed densely flowered branches. *Spikelets* 3–4 mm long excluding hairs. *First glume* of lowermost spikelet of pair obtuse or acute, often 0.3 mm or more long. *Second glume* and margins of lemma of lower floret densely hirsute with silvery or purple-tinged hairs 2–4 mm long, the back of lower lemma glabrous. *Lemma* of upper floret ovate-lanceolate, abruptly narrowed to short awn tip.

Colorado to Texas, Arizona, and northern Mexico, in dry grassland and on open rocky slopes. BAJA CALIFORNIA: In the NW mostly at 1000–1200 m in S Sierra Juárez and N Sierra San Pedro Mártir; Ensenada; in desert S to San José del Cabo, from coast to 1650 m but commonly above 700 m; Islas San Marcos and Carmen. The type collection is from Bahía Magdalena.

2. *Digitaria horizontalis* Willd., Enum. Hort. Berol. 92. 1809. Annual with decumbent, spreading, branching, often stoloniferous culms. *Sheaths* hispid or pilose with long spreading hairs. *Blades* thin, flat, mostly 5–15 mm broad, finely pilose on one or both surfaces. *Panicles* with 5–15 unbranched primary branches, the lower ones in verticels of 3–6.

Branch rachis usually with a few scattered papilla-based hairs as much as 5–6 mm long. *Spikelets* 2–2.2 mm long. *First glume* usually absent, the second ca. half as long as spikelet, pilose on margins and tip. *Lemma* of lower floret with 5 equidistant nerves, with a few soft hairs on margins.

Widespread in tropical regions of both hemispheres, usually a weed of disturbed soils. BAJA CALIFORNIA SUR: Dr. Alan Beetle reports (letter to Gould) that he has a collection (*Ruth M-2584*) from near Miraflores. We have not examined the specimen.

3. *Digitaria ciliaris* (Retz.) Koel., Descr. Gram. 27. 1802. *D. adscendens* (H.B.K.) Henr., *D. sanguinalis* (L.) Scop. var. *ciliaris* (Retz.) Parl. ZACATE CANGREJO VELLUDO. Annual with weak decumbent and basally branching culms mostly 70 cm or less tall, often rooting at lower nodes. *Ligules* glabrous, mostly 1–2.5 mm long. *Leaves* glabrous or sparsely hispid with papilla-based hairs. *Blades* flat, 5–10 mm broad. *Inflorescence* with usually 4–9 slender unbranched primary branches mostly 6–14 cm long, the branches digitate at culm apex or at apex and in 1–2 verticels below. *Branch rachis* strongly winged, 1–1.4 mm broad, with spikelets in unequally pediceled pairs, the members of pair essentially similar but sometimes one or the other villous on nerves of lemma of lower floret. *Spikelets* 2.3–3 mm long. *First glume* minute, scale-like. *Second glume* 1–1.7 mm long, usually puberulent on margins. *Lateral nerves* of lemma of lower floret scabrous, rarely long-villous. *Palea* of lower floret minute or absent.

Presumably adventive in North America, the type of *D. ciliaris* from Asia but the type of *D. adscendens*, a synonym, from South America. Now widespread in North America from Canada to Mexico and in South America, a weed of fields, gardens, ditches, roadsides, and other areas of disturbed soil, usually at low to moderately high elevations. BAJA CALIFORNIA NORTE: Roadside N of Sauzal on Tecate road (*Moran 25104*). BAJA CALIFORNIA SUR: Mulegé; W of Loreto; La Paz; Triunfo; S of El Valle Perdido; El Taste; San José del Cabo.

4. *Digitaria bicornis* (Lam.) R. & S., Syst. Veg. 2:470. 1817. *D. diversifolia* Swallen. Annual with decumbent-spreading culms, often stoloniferous at base and rooting at lower nodes. Generally similar to *D. ciliaris* but differing in the key characters and in the minute rounded or truncate first glume that is 0.3 mm or less long.



Fig. 67. *Digitaria californica*: plant, spikelet. From Gould, 1951, 1975.

A weed of cultivated areas, roadsides, and waste places, in the tropics and subtropics of the world, apparently introduced in North America from Asia. At low elevations in Baja California. BAJA CALIFORNIA NORTE: Tijuana; Presa Rodríguez. BAJA CALIFORNIA SUR: La Paz; San Pedro; 40 km S of La Paz; Ribera; Sierra San Francisquito; Miraflores; San José del Cabo.

Based on our present knowledge of the "crabgrass" group of *Digitarias*, the separation of *D. bicornis* from *D. ciliata* is not altogether satisfactory. The collection Gould 11850 from near Triunfo (referred to *D. ciliaris*) has the characteristic lemma nervation of *D. ciliaris*, but the lemmas of some lower florets of both sessile and pediceled spikelets have the spreading marginal hairs typical of *D. bicornis*.

5. *Digitaria sanguinalis* (L.) Scop., Fl. Carn., ed. 2, 1:52. 1772. *Panicum sanguinale* L. Annual with decumbent base, rooting at lower nodes, with pa-

pilla-based hairs on leaf sheaths and blades. *Ligule* a membrane 0.7–2.6 mm long. *Panicle* of 3–9 unbranched primary branches mostly 3–19 cm long, the branch rachis with wing wider than body. *Paired spikelets* alternate on branches, lanceolate, 2.5–3.2 mm long, with spicules on lateral nerves. *First glume* a small acutely triangular scale. *Second glume* half to nearly as long as spikelet. *Lemma* of lower floret with 5 or 7 nerves, the lateral crowded to margins, with conspicuous spicules.

Widespread in North America, mostly in western and northern USA but also in Mexico, an occasional weed of disturbed soil. BAJA CALIFORNIA SUR: Sierra de la Laguna, *León de la Luz* 349 (TAES).

Robert Webster identified the specimen, gave us information about the species, and revised our key to include it.

69. *Brachiaria* Griseb.

Annuals and perennials, mostly with spreading decumbent or stoloniferous culms. *Ligule* a short fringed membrane. *Inflorescence* usually a few-flowered panicle, with spikelets paired or single, short-pedicel or sessile on short spreading unbranched or sparingly branched primary branches. *Spikelets* awnless, with first glume oriented towards rachis, 2-flowered, the upper floret perfect, the lower staminate or neuter. *Glumes* unequal, the first short and broad, the second as long as lemma of lower floret. *Lemma* of upper floret firm or hard, usually rugose in transverse lines but occasionally smooth, with margins inrolled over palea. In all our species the lemma of the upper floret is finely to coarsely transverse-rugose.

1. Plants perennial, with long stout creeping stolons . . . 1. *B. purpurascens*
1. Plants annual, the culms erect, not stoloniferous.
 2. Spikelets 2.4–3 mm long, glabrous . . . 2. *B. fasciculata*
 2. Spikelets 3.3–4.5 mm long, the glumes and lower lemma sparsely to strongly pubescent . . . 3. *B. arizonica*

1. *Brachiaria purpurascens* (Raddi) Henr., *Blumea* 3:434. 1940. *Panicum purpurascens* Raddi. PARAGRASS. Fig. 68. Coarse perennial with tall erect flowering culms and usually trailing stoloniferous leafy culms as much as 4–5 m long. *Nodes* (actually sheath bases) densely bearded. *Sheaths* rounded, usually pubescent on collar as well as at base. *Ligule* a short fringed membrane. *Blades* flat, scabrous or hispid with papilla-based hairs, mostly 10–30 cm long and 0.5–1.5 cm broad. *Panicles* mostly 12–20 cm long, with usually 8–18 loosely spaced primary branches 2–9 cm long; these usually simple but lowermost occasionally with short secondary branch;

base of panicle branches villous-pubescent. *Spikelets* short-pedicel, imbricate and more or less paired on flattened branch rachis, narrow, glabrous, 2.8–4 mm long, the pedicels often with a few long silvery hairs. *First glume* acute, usually 1 mm long or less. *Second glume* ca. equalling lemma of lower floret. *Lower floret* staminate, with thin membranous palea as long as lemma or longer. *Lemma and palea* of upper floret finely rugose.

Long cultivated in the American tropics as a forage grass, paragrass now is occasional to frequent along waterways and wet meadows of North America as far north as Florida and Texas. BAJA CALIFORNIA SUR: La Paz (*Palmer in 1890*); Rancho Saltillo, Cape region (*Carter & Chisaki 3465*).

2. *Brachiaria fasciculata* (Sw.) L. Parodi, *Darwiniana* 15:96. 1969. *Panicum fasciculatum* Sw. PANIZO FASCICULADO, BROWNTOP. Fig. 69. Annual with erect or decumbent-creeping culms 30–100 cm or more long. *Culm nodes* usually appressed-pubescent, the internodes often hispid also. *Ligule* a fringe of hairs ca. 1 mm long. *Lower sheaths and blades* usually hispid, the upper tending to be glabrous or sparsely hispid. *Blades* short, mostly 5–15 mm broad. *Panicles* 6–15 cm long, with appressed or erect-spreading, mostly simple and rather sparsely flowered branches 1–8 cm long. *Branchlets* and the short pedicels usually scabrous or short-pubescent and with few to numerous long stiff silvery hairs. *Spikelets* mostly 2–3.1 mm long, glabrous, broadly rounded, usually yellowish-brown or bronze-colored. *First glume* broad, usually obtuse, $\frac{1}{4}$ – $\frac{1}{3}$ as long as spikelet. *Second glume and lower lemma* usually reticulate with fine cross veins to well below middle. *Lemma of upper (perfect) floret* transversely rugose, slightly beaked or apiculate.

Florida to Arizona and southward to South America, a weedy grass of moist ditches, field borders, and waste places. BAJA CALIFORNIA SUR: Low to intermediate elevations, most frequent in coastal areas: Canipolé; Sierra de la Giganta (Potrero de San Javier; E base of Cerro de la Giganta); Loreto; W of Ligüi; 112 km NW of La Paz; La Paz.

3. *Brachiaria arizonica* (Scribn. & Merr.) S. T. Blake, *Proc. Roy. Soc. Queensland* 81(1):4. 1969. *Panicum arizonicum* Scribn. & Merr. ARIZONA BRACHIARIA. Tufted annual with erect or geniculate-spreading culms mostly 15–60 cm tall and usually freely branched. *Culms* glabrous or sparsely hispid at nodes and below panicle. *Leaves* sparsely hispid with papilla-based hairs to nearly glabrous, the blades usually with a few widely spaced coarse



Fig. 68. *Brachiaria purpurascens*: plant, two views of spikelet, floret. From Hitchcock, 1935.

cilia on lower margins. *Blades* thin, mostly 5–18 cm long and 3–10 mm broad. *Panicles* 7–15 (–20) cm long, narrow, with short usually simple erect or spreading branches, the main axis and branches pilose or hispid with silvery hairs. *Spikelets* mostly 3.3–4 mm long, borne on pedicels mostly 0.5–1 mm long except for those terminating branches. *Glumes and lemma of lower floret* pubescent or pilose. *First glume* $\frac{1}{4}$ – $\frac{1}{2}$ as long as spikelet. *Lemma of upper floret* finely rugose or reticulate, slightly apiculate, about 3 mm long.

Texas to southern California and western Mexico, mostly on rocky slopes, in sandy washes, and along canyon bottoms, in Baja California recorded from near sea level to 1680 m. BAJA CALIFORNIA NORTE: Sierra Juárez about Paso San Matías; Rosarito; Sierra San Borja. BAJA CALIFORNIA SUR: Common south to Cabo San Lucas; Isla Espíritu Santo.

70. *Eriochloa* H.B.K.

1. *Eriochloa lemmonii* Vasey & Scribn. var. *gracilis* (E. Fourn.) Gould, Leaf. W. Bot. 6:51. 1950. *E.*



Fig. 69. *Brachiaria fasciculata*: plant, spikelet, fertile floret. From Gould and Box, 1965.

gracilis (E. Fourn.) Hitchc. Fig. 70A. Annual with tufted culms mostly 20–70 cm tall, usually decumbent and geniculate below. *Ligule* a ring of soft hairs. *Blades* thin, bright green, glabrous or rarely thinly pilose, mostly 5–10 (–12) mm broad. *Inflorescence* mostly 6–18 cm long, with spikelets short-pedicelled on erect or at length stiffly spreading branches mostly 1–5 cm long. *Panicle branches* and pedicels pubescent with short and occasionally long hairs, these often somewhat viscid. Disarticulation at base of spikelet. *Spikelets* including awns 4.5–8 mm long. *First glume* reduced to cup or disc; second glume acuminate or short awn-tipped, as long as spikelet. *Lemma of lower floret* similar to second glume but slightly shorter, also appressed-pubescent. *Lemma and palea of upper floret* firm, gla-



Fig. 70. *Eriochloa lemmonii*: plant, spikelet, grain; A, spikelet of var. *gracilis*. From Gould, 1951.

brous, minutely rugose, the lemma about 3.5 mm long, abruptly mucronate or short-awned.

Texas to Arizona and western Mexico, along sandy washes and in depressions, often in disturbed soils. BAJA CALIFORNIA SUR: Mostly below 750 m: San Ignacio; Cuarenta; Santa Rita; S of Loreto; Cerro la Giganta; Triunfo.

Wiggins (1980:945) reported *Eriochloa aristata* Vasey from open areas of NE Baja California; but we have seen no specimens.

71. *Panicum* L.

Annuals and perennials of diverse habit. *Inflorescence* an open or contracted panicle, usually with at least some primary branches rebranched. *Spikelets* 2-flowered, awnless, plano-convex, the

lower floret staminate or neuter, the upper perfect. Both glumes usually present, the first commonly short, the second about equalling lemma of lower floret. *Lemma of lower floret* similar to glumes in texture. *Lemma and palea of upper floret* firm or indurate, shiny and glabrous in our species, the lemma tightly clasping palea with thick, usually inrolled margins.

1. Plants perennial.
 2. Spikelets glabrous, 2.5–5 mm long.
 3. Culm bases swollen and bulbous; lemma and palea of upper floret finely rugose 1. *P. bulbosum*
 3. Culm bases hard, often rhizomatous, not swollen; lemma and palea of upper floret smooth.
 4. Spikelets 3–5 mm long; culms in dense clumps, little branched above; glumes narrowly acute or acuminate 2. *P. virgatum*
 4. Spikelets 2.5–3 mm long; culms branched and bushy in age; glumes rounded to broadly acute 3. *P. antidotale*
 2. Spikelets villous, 6–7 mm long 4. *P. urvilleanum*
1. Plants annual; culm bases not swollen or bulbous.
 5. Spikelets 1–1.4 mm long; pedicels often 1–2 cm long 5. *P. trichoides*
 5. Spikelets 2.4–3.8 mm long; pedicels short or long.
 6. Lemma of upper (perfect) floret transversely rugose; spikelets subsessile or short pediceled on simple or nearly simple primary inflorescence branches SEE 69. BRACHIARIA
 6. Lemma of upper floret smooth; spikelets short or long-pediceled in open, usually freely rebranched panicles.
 7. Glumes and lemma of lower floret pubescent or hispid SEE 69. BRACHIARIA
 7. Glumes and lemma of lower floret glabrous.
 8. Pulvini in axils of lower panicle branches glabrous (rarely pubescent); pedicels short, those of lateral spikelets rarely as long as spikelet 6. *P. hirticaule*
 8. Pulvini in axils of lower panicle branches hairy; pedicels long, most or all pedicels longer than spikelets and some usually 1–2 cm long 7. *P. capillare*

1. *Panicum bulbosum* H.B.K., Nov. Gen. Sp. 1:99. 1815. BULB PANIC. Fig. 71. Perennial with culms 50–140 cm tall, usually in small clumps. *Base of plant* firm knotty, often rhizomatous, the culm bases typically but not always swollen and bulbous. *Ligule* a short-ciliate membrane 0.5–2 mm long. *Blades* flat, elongate, glabrous or variously hairy on one or both surfaces, usually 2–6 mm broad but as much as 15 mm broad in some forms. *Panicles* open, well-exserted, 12–40 (–50) cm long, the spikelets short-pediceled but loosely arranged on slender branchlets. *Spikelets* glabrous, narrowly oblong, mostly 2.8–3.9 mm long. *First glume* ca. half as long as spikelet, broadly acute at apex. *Second glume* and lemma of lower floret about equal, often slightly beaked at apex. *Lower floret* staminate or neuter, with well-developed palea. *Lemma and palea of upper floret* finely rugose, usually shiny.

On rocky canyon slopes and in ravines, Texas, New Mexico, and Arizona, through mountainous areas of Mexico to Central and northern South America. BAJA CALIFORNIA SUR: Cape region: La Laguna, Sierra de la Laguna (Jones in 1930); La Chuparosa (Brandegec 80).

2. *Panicum virgatum* L., Sp. Pl. 59. 1753. SWITCHGRASS. Perennial with scaly creeping rhizomes. Culms firm, erect, 60–120 cm or more tall, glabrous or pubescent at nodes. Sheaths rounded, glabrous. Ligule a short fringed membrane. Blades firm, flat, elongate, 3–15 mm broad, usually glabrous but occasionally pilose. Panicles large, open, broad or narrow, usually many-flowered, the spikelets short-pedicelled on long slender branches. Spikelets glabrous, awnless, mostly 3–5 mm long. Glumes acute or acuminate, the first $\frac{2}{3}$ – $\frac{3}{4}$ as long as second, the second about equalling lower lemma. Lower floret usually staminate, with acuminate lemma and large palea. Lemma of upper floret narrowly ovate, smooth and shiny, light-colored.

Widespread in North America, from SE Canada through most of USA except on the Pacific coast, northern Mexico, and Cuba. BAJA CALIFORNIA SUR: Cañón San Pablo [SE of El Arco] (Purpus 7683).

3. *Panicum antidotale* Retz., Obs. Bot. 4:17. 1786. BLUE PANIC. Perennial with hard knotty base, branched and bushy in age, 0.5–2 (–3) m tall. Sheaths glabrous or collar puberulent. Ligule a fringed membrane 0.5–1 mm long. Blades flat, elongate, mostly 4–12 mm broad. Panicles open to somewhat contracted, freely branched, mostly 12–25 cm long. Spikelets glabrous, broadly ovate, 2.5–3 mm long, on short pedicels and tips of short branchlets. First glume thin, broadly rounded or obtuse, mostly half or a third as long as spikelet. Second glume and first lemma ca. equal, broad and thin at apex. Lemma of upper floret smooth, shiny, narrowly pointed, ca. equalling spikelet.

Native to India; introduced in SW USA, Mexico, and elsewhere, as a forage grass. BAJA CALIFORNIA NORTE: sizable clumps at roadside, rocky slope with *Larrea*, *Fouquieria*, *Pachycereus*; 11 km NNW of Chapala, 760 m (Reeder & Reeder 7178). Reported by Reeder and Reeder (1981:556), who kindly sent us the details.

4. *Panicum urvilleanum* Kunth, Rev. Gram. 2:403. 1831. Culms solitary or few together, 50–100 cm tall, erect from creeping rhizome. Culm nodes densely bearded. Sheaths overlapping, retrorse-villous. Blades elongate, 4–7 mm broad, tapering from



Fig. 71. *Panicum bulbosum*: plant, spikelet, grain. From Gould, 1951.

flat base to long involute setaceous tip. Panicles 25–30 cm long, with slender ascending branches. Spikelets 6–7 mm long, densely villous. First glume broad, clasping on margins, from $\frac{2}{3}$ to nearly as long as spikelet.

Sandy deserts, California and Arizona; also Chile and Argentina. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:946) as "occasional in sandy soil, Creosote Bush Scrub, N B.C.", but we have seen no specimens.

5. *Panicum trichoides* Sw., Prod. Veg. Ind. Occ. 24. 1788. Annual with weak decumbent or stoloniferous many-noded much-branched culms, the erect floriferous branches mostly 15–60 cm tall including panicle. Sheaths papillose-hispid with spreading hairs. Ligule absent or a ring of short or long hairs. Blades short, flat, thin, broad, mostly 3–7 cm long and 7–15 mm broad, usually thinly pilose and ciliate on margins towards base. Panicles open, large and small, freely branched, with minute spikelets on long pedicels. Spikelets mostly 1.2–1.5 mm long, narrow, tapering to both ends. First glume ca. $\frac{1}{3}$ as long as spikelet. Second glume and lemma of lower floret hispid, the second glume

usually broadly rounded at apex and shorter than both lemma of lower floret and lemma of upper floret. *Lemma and palea of upper floret* minutely rugose.

Mexico and the Antilles to Peru and Brazil, usually on moist banks in partial shade, occasionally a weed of cultivated areas. BAJA CALIFORNIA SUR: Along road to La Junta, S of El Valle Perdido (Wiggins 15359).

6. *Panicum hirticaule* Presl, Rel. Haenk. 1:308. 1830. *P. capillare* L. var. *hirticaule* (Presl) Gould. PANIZO CAUCHÍN, ROUGHSTALK WITCHGRASS. Tufted annual with erect or geniculate-spreading culms mostly 15–80 cm tall. *Culms* glabrous or lower nodes and internodes sparsely short-hispid. *Sheaths and blades* hispid with papilla-based hairs to sparsely pilose or essentially glabrous. *Ligule* a ring of hairs 0.9–3.5 mm long. *Blades* mostly 7–15 cm long and 3–12 mm broad but extremely variable. *Panicles* open, 5–20 cm long, $\frac{1}{4}$ – $\frac{1}{2}$ as broad as long. *Lateral spikelets* appressed to branchlets on pedicels mostly 1–2.5 mm long, those terminating branches on pedicels to 5 mm long. *Spikelets* glabrous, narrowly ovate, mostly 2.3–3.5 mm long. *First glume* averaging half as long as spikelet. *Palea of lower floret* usually well-developed. *Lemma of upper floret* smooth and shiny, with or without crescent-shaped scar at base.

Usually on dry open slopes and sandy flats and in dry sandy washes, southern California to Texas and south into drier parts of Mexico. BAJA CALIFORNIA NORTE: Sierra Juárez, 1300–1680 m (SE of San Faustino; La Botella; Portezuelo de Jamau); San Antonio, Sierra San Pedro Mártir, 1125 m. BAJA CALIFORNIA SUR: S of El Arco; Cerro la Laguna, Sierra San Francisco, 1450 m; San Ignacio; N of Cuarenta, 30 m; S of Loreto; Sierra de la Giganta, 500–1250 m; Pichilingue; San Pedro; Triunfo; Isla San José.

Panicum capillare var. *glabrum* Vasey in Brandegee, nomen nudum (Proc. Calif. Acad. Sci. Ser. 2, 2:211. 1889), based on *Brandegee in 1889* from La Purisima, belongs here according to Hitchcock (1935a:907).

7. *Panicum capillare* L., Sp. Pl. 58. 1753. COMMON WITCHGRASS. Tufted annual with usually much-branched spreading culms mostly 20–80 cm tall but much shorter on depauperate plants, pubescent at least at lower nodes. *Leaves* usually papillose-hispid with spreading hairs, the blades occasionally merely ciliate on margins below. *Panicles* large, diffuse, usually $\frac{1}{2}$ or more as broad as long and

often $\frac{1}{2}$ or more the entire length of culm, with spikelets usually widely spaced and on long pedicels; panicle breaking off as a unit at maturity. *Pedicels* slender, at least some 1–3 cm or more long. *Spikelets* glabrous, usually 2–3.5 mm long, the tips of upper glume and lemma of lower floret rather abruptly extended into acuminate apex. *First glume* acute to acuminate, $\frac{1}{3}$ – $\frac{2}{3}$ as long as spikelet. *Palea of lower floret* typically absent but occasionally present. *Lemma of upper floret* smooth and shiny, 1.3–2.3 mm long, without scars at base.

Southern Canada through most of USA to Mexico, usually as a weed of roadsides, ditches, vacant lots, and cultivated areas. BAJA CALIFORNIA NORTE: In the NW at low elevations near coast: San Rafael; San Telmo; Río Santo Domingo above the mission; N of San Quintín.

72. *Dichanthelium* (Hitchc. & Chase) Gould

1. *Dichanthelium oligosanthos* (Schult.) Gould var. *scribnerianum* (Nash) Gould, Brittonia 26:60. 1974. *Panicum scribnerianum* Nash. *P. helleri* Nash. ZACATE HOJA ANCHA, SCRIBNER'S DICHANTHELIUM. Fig. 72. Perennial with culms loosely to densely tufted from knotty base. *Culms* mostly 15–80 cm long. *First-formed leaves* of growing period short, relatively broad, forming rosette. *Lower sheaths* puberulent or hispid, the upper glabrous or hairy on sides of collar. *Blades* short and flat, rather thick, 3–12 cm long and usually 4–12 mm broad, the lower usually finely pubescent and often with a few coarse hairs, the upper glabrous or scabrous. *Primary inflorescence* usually a small open panicle; secondary panicles few-flowered, partially included in sheath. *Spikelets* broadly oblong or obovate, pilose or papillate-pilose, 2.5–4 mm long, awnless, 2-flowered, the lower floret usually neuter, the upper perfect. *First glume* $\frac{1}{4}$ – $\frac{1}{3}$ as long as spikelet, the second glume and lemma of lower floret about equal or second glume slightly shorter. *Lemma and palea of upper floret* firm, shiny, finely rugose, often somewhat beaked at apex.

Widespread in North America, mostly in eastern and central USA but also in Mexico, in partial shade or in open sites. BAJA CALIFORNIA NORTE: Local in crevice in bare granite, gorge 5 km SW of La Grulla, Sierra San Pedro Mártir, 1850 m (Moran 24477).

73. *Stenotaphrum* Trin.

1. *Stenotaphrum secundatum* (Walt.) Kuntze, Rev. Gen. Pl. 2:794. 1891. GRAMILLÓN DE SAN AGUSTÍN,



Fig. 72. *Dichanthelium oligosanthes* var. *scribnerianum*: plant, spring and summer phase left, autumnal phase right; two views of spikelet; grain. From Gould, 1951.



Fig. 73. *Stenotaphrum secundatum*: plant, fertile floret, two views of spikelet. From Chase, 1951.

ST. AUGUSTINE GRASS. Fig. 73. Mat- or turf-forming perennial with coarse widely creeping and freely branched stolons and erect flowering culms mostly 10–30 cm tall. *Leaves* succulent, glabrous except sheaths sparsely ciliate on margins and the short membranous ligule ciliate. *Blades* thick, flat, 4–10 mm broad, blunt at apex. *Inflorescence* spike-like, 5–10 cm long, 4–6 mm broad, with spikelets borne on closely placed rudimentary appressed branches on one side of flattened corky inflorescence axis. *Branches* bearing 1–3 sessile or subsessile spikelets, the lower 1–2 often not developing. *Spikelets* glabrous, 4–5 mm long, 2-flowered, the lower floret staminate or neuter, the upper perfect. *Glumes* broad, the first short, rounded, the second as long as lemma of lower floret, acute. *Lemma* of upper floret leathery, awnless, with thin, flat margins.

Tropics and subtropics of the world, primarily a seashore pioneer; in North America probably not native, grown as a lawn grass in warm regions and often persisting as a weed of city lots, roadsides, and other disturbed areas. BAJA CALIFORNIA NORTE: Yard of vacant house, Playas de Tijuana (Moran 18543); small colony with beach drift,

sandy shore at Ensenada (Moran 29315). BAJA CALIFORNIA SUR: Planted in La Paz (Reeder & Reeder 6610, as reported to us in letter).

74. *Paspalidium* Stapf

1. *Paspalidium geminatum* (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9:583. 1920. *Panicum geminatum* Forssk. EGYPTIAN PASPALIDIUM. Fig. 74. Perennial with culms in small clumps from firm base. *Culms* and *leaves* glabrous. *Ligule* a short ciliate membrane. *Blades* elongate, 3–6 mm broad, flat or folded. *Inflorescence* narrow and elongate, with spikelets subsessile on 7–17 short spicate branches. *Inflorescence branches* erect, mostly 2–3 cm long, single at nodes, widely spaced below and progressively closer together and shorter above. *Spikelets* in 2 rows on flattened rachis, with rounded back of lemma of upper floret towards rachis. *Disarticulation* below glumes. *Spikelets* 2.2–3 mm long, ovate or elliptic, 2-flowered, the lower floret sterile or staminate, the upper perfect. *First glume* short and broad, rounded at apex, $\frac{1}{4}$ – $\frac{1}{3}$ as long as spikelet.



Fig. 74. *Paspalidium geminatum*; plant, two views of spikelet, floret. From Hitchcock, 1935.

Palea of lower floret about as long as lemma. *Lemma* and *palea* of upper floret firm, finely rugose, acute at apex.

Wet or moist habitats, mostly along lakes, streams, and ditches, often in shallow water, southern Oklahoma to Texas and Florida and through Mexico to Central and northern South America. BAJA CALIFORNIA SUR: Primer Agua near Loreto (Jones in 1930); San Javier (Beetle M-2448); S of Santiago (Beetle M-2580); El Taste (Brandege in 1893); San José del Cabo (Brandege 14, 36).

75. *Paspalum* L.

Annuals and perennials, many with rhizomes. *Ligule* a membrane or a ring of hairs. *Blades* usually flat, often broad. *Inflorescence* with 2, occasionally 1, to many unbranched spicate primary

branches, these scattered or, in a few species, paired at culm apex. *Spikelets* subsessile or short-pedicel in 2–4 rows on branch rachis, awnless, 2-flowered, the lower floret staminate or neuter, the upper perfect. *First glume* typically absent but irregularly present in a few species. *Lemma* and *palea* of upper floret firm or indurate, usually smooth and shiny, the lemma margins inrolled over palea.

1. Inflorescence branches 2, paired or less than 1 cm apart at culm apex (1–2 additional branches occasionally present below).
2. Second glume and lemma of lower floret pubescent, the lemma convex 1. *P. paspalodes*
2. Second glume and lemma of lower floret glabrous, the lemma flat 2. *P. vaginatum*
1. Inflorescence branches 1 to numerous, when 2 then 1–2 or more cm apart.
3. Spikelets 2.6 mm or more long, pubescent or pilose.
4. Margins of spikelets not ciliate with long hairs 3. *P. pubiflorum*
4. Margins of spikelets ciliate with long hairs.
5. Inflorescence branches mostly 12–20 7. *P. urvillei*
5. Inflorescence branches 3–6 8. *P. dilatatum*
3. Spikelets 2 mm long or less.
6. Spikelets glabrous 4. *P. squamulatum*
6. Spikelets pubescent.
7. Spikelets 1.7–1.9 mm long, not densely crowded 5. *P. lentiginosum*
7. Spikelets 1.3–1.4 (–1.5) mm long, crowded 6. *P. paniculatum*

1. *Paspalum paspalodes* (Michx.) Scribn., Mem. Torrey Bot. Club 5:29. 1894. *P. distichum* auth., not L. CAMALOTE SALADILLO, KNOTGRASS. Perennial with creeping rhizomes and slender wiry stolons, the erect floriferous culms to 60 cm tall. *Sheaths* large, conspicuous. *Ligule* a minute scale-like membrane, often with row of short hairs just above. *Blades* linear-lanceolate, often infolded or inrolled on drying, usually 2–7 mm broad. *Inflorescence* with 2 more or less paired branches at culm apex, occasionally with 1 or 2 additional branches irregularly developed below; branches usually 2–6 cm long, with broad triangular rachis and sessile or short-pedicel spikelets in 2 rows. *Spikelets* narrow, 2.6–4 mm long, acute at apex. *Lower glume* typically absent but occasionally irregularly developed. *Upper glume* weakly 5-nerved, appressed-pubescent. *Lemma* of lower floret often wrinkled.

In wet soil along streams and lakes, southern USA to South America and in the Old World. BAJA CALIFORNIA NORTE: Common in and along streams in the NW: near coast (between Medio Camino and Alisitos; Cañon San Carlos; Eréndira; Villa Guerrero); Sierra Juárez to 1600 m (Nejí; S of La Hchicera; Laguna Hanson); Sierra San Pedro Mártir to 2100 m (Encinal; La Grulla; San Isidoro; ex-misión San Pedro Mártir). Also: 18 km S of Mexicali;

ex-misión San Borja. BAJA CALIFORNIA SUR: Cerro de la Giganta; El Chorro, Cape region, 200 m.

This widespread grass has long gone under the Linnaean name of *P. distichum*—a name recently the subject of much debate. We accept the view of Fosberg (1977) that the Linnaean type is the plant generally known as *P. vaginatum* Sw.

2. *Paspalum vaginatum* Sw., Prod. Veg. Ind. Occ. 21. 1788. *P. distichum* L. SEASHORE PASPALUM. Similar to *P. paspalodes*, differing mainly in the key characters and in anatomical and epidermal features; first glume rarely developed.

North Carolina to Florida and Texas and south to Argentina, typically in saline coastal sands. BAJA CALIFORNIA SUR: San José del Cabo (Brandege 2 of 1900, cited by Hitchcock, 1913:231).

We agree with Fosberg (1977) that the correct name for this grass is *P. distichum* L. However, we anticipate acceptance of the proposal by Renvoize and Clayton (1980) to reject this name as a nomen confusum. Others, including Guédès (1981), object to this proposal.

3. *Paspalum pubiflorum* Rupr. ex E. Fourn., Mex. Pl. 2:11. 1886. CAMALOTE VELLUDO, HAIRYSEED PASPALUM. Fig. 75. Rather coarse perennial with culms mostly 30–70 cm tall from decumbent spreading bases. *Sheaths of lower leaves* pilose at base with papilla-based hairs appearing as nodal hairs. *Ligule* a short usually brownish membrane. *Blades* elongate, mostly 6–15 mm broad, usually scabrous and with a few pustula-based hairs above ligule. *Inflorescence* of 2–5 (–7) branches mostly 3–10 cm long. *Branch rachis* flat, 1–2 mm broad, bearing 4 rows of closely placed spikelets or two rows by abortion of upper spikelet of each pair. *Spikelets* 2.7–3.2 mm long, elliptic or ovate, pointed but not sharply so. *First glume* absent; second glume as long as spikelet, rounded on back, pubescent, with well-defined midnerve. *Lemma of lower floret* flat or concave, scabrous or short-pubescent. *Lemma and palea of upper floret* firm, smooth and shiny.

Louisiana and Texas to Cuba and throughout Mexico, in ditches and other low moist areas, occasionally in partial shade. BAJA CALIFORNIA SUR: Chase (1929:55) cited Palmer 45 of 1887, from "Maleje" [Mulegé].

4. *Paspalum squamulatum* E. Fourn., Mex. Pl. 2:11. 1886. Perennial with slender weak culms 25–90 cm long and in age tending to be decumbent and often rooting at lower nodes. *Nodes* dark. *Sheaths* ciliate with soft hairs on margins and usually pubescent on collar. *Ligule* brownish, 3–3.5 mm long.



Fig. 75. *Paspalum pubiflorum*: inflorescence, pair of spikelets. From Gould and Box, 1965.

Blades flat, 3–15 mm broad, slightly narrowed at base, ciliate on margins and variously pubescent on one or both surfaces to nearly glabrous. *Panicle branches* 3–13, usually 5–6, mostly 1.5–6 cm long. *Branch rachis* narrow, scabrous on margins, bearing short-pediceled spikelets in pairs. *Spikelets* 1.6–1.9 mm long, broadly elliptic-obovate, pale green, glabrous. *First glume* absent. *Second glume* and

lower lemma 3-nerved, the glume shorter than lemma and exposing lemma of upper floret at maturity. *Lemma* of upper (perfect) floret pale, smooth and shiny.

Brushy or forested slopes, mostly at 500–1700 m, southern Mexico to Guatemala and Nicaragua. BAJA CALIFORNIA SUR: San José del Cabo (*Bran-degee* 40, cited by Chase, 1929:119).

5. *Paspalum lentiginosum* Presl, Rel. Haenk. 1:218. 1830. Tufted leafy perennial with sparingly branched culms 75–140 cm tall. *Sheaths* sparsely pilose to papillose-pubescent. *Ligule* 2–4 mm long. *Blades* flat, elongate, mostly 8–14 mm broad, rounded at base, with a few long hairs above ligule. *Panicles* well-exserted, with usually 4–13 branches, the lower ones 4.5–11 cm long, the upper shorter. *Branch rachis* very slender, with a few long white hairs at base, bare of spikelets for lower 2–8 mm. *Spikelets* 1.7–1.9 mm long, broadly elliptic, loosely imbricated in pairs on slender pedicels. *First glume* absent, the second glume and lemma of lower floret equal, the glume finely papillose-pubescent, the lemma glabrous or nearly so, both speckled with purplish brown. *Lemma* and *palea* of upper floret yellowish, smooth and shiny.

Western Mexico and Guatemala, mostly on low open moist ground. BAJA CALIFORNIA SUR: To this species we tentatively refer a collection from Mulegé (*Howe in* 1964). However, this specimen is atypical in having spikelets only 1.3–1.5 mm long and possibly belongs instead with *P. paniculatum*.

6. *Paspalum paniculatum* L., Syst. Nat., ed. 10. 2:855. 1759. Coarse cespitose leafy perennial with large broad blades and elongated panicles with numerous slender branches and very small spikelets. *Culms* sometimes decumbent and rooting at basal nodes, usually 30–100 cm tall. *Nodes* (really sheath bases) often bearded with coarse hairs. *Sheaths* coarsely papillose-hispid throughout or only on margins and collar. *Ligule* 2–3 mm long. *Blades* elongate, usually 10–25 mm broad. *Panicle* axis commonly 5–20 cm long, with usually 10–60 slender spreading racemes, the lower mostly 5–12 cm long, the upper shorter. *Branch rachis* slender but stiff, often with a few long hairs at base and on margins. *Spikelets* in pairs on slender pedicels, 1.3–1.5 mm long and ca. 1 mm broad. *First glume* absent, the second glume and lemma of lower floret equal, blotched or speckled with brown or purple, usually puberulent on back or margins but occasionally glabrous on most spikelets of inflorescence.

Tropical regions of the world, in moist open

ground and on brushy slopes, often a weed of cultivated soil. BAJA CALIFORNIA SUR: San José del Cabo (*Jones* 27618).

Of this widespread and variable species Chase (1929:124) wrote “Dwarf plants with but 4 or 5 short racemes are found in the mountains or in dry situations. The foliage is rarely nearly glabrous.”

7. *Paspalum urvillei* Steud., Syn. Pl. Gl. 1:24. 1854. VASEY-GRASS. Coarse perennial with stiffly erect culms mostly 1–2 m tall, in large leafy clumps. *Lower sheaths* usually hirsute or villous with long hairs; upper sheaths glabrous. *Ligule* membranous, well-developed. *Blades* long and coarse, mostly 4–15 mm broad, usually with tuft of hairs just above ligule. *Inflorescence* branches usually 8–30, erect, 4–10 (–14) cm long, with closely imbricated spikelets in 4 rows. *Spikelets* 2.2–2.7 mm long. *First glume* absent; second glume and lemma of lower floret pubescent with long hairs on margins; lemma also pubescent on back.

Introduced from South America; now frequent in SE USA and occasional in California and western Mexico, mostly in rather moist soil of ditches and roadsides. BAJA CALIFORNIA NORTE: Reported by Wiggins (1980:947) from northern Baja California, without specific locality. We have seen no specimens.

8. *Paspalum dilatatum* Poir. in Lam., Encycl. 5:35. 1804. DALLIS-GRASS. Cespitose perennial with culms mostly 50–120 cm tall from hard knotty base. *Lowermost sheaths* usually hirsute, the upper glabrous. *Ligule* a brownish membrane 1.5–3 mm long. *Blades* firm, flat, mostly 3–12 mm broad, glabrous or sparsely ciliate near base. *Inflorescence* branches mostly 2–7, widely spaced on slender axis. *Spikelets* closely imbricated in 4 rows on broad flat rachis 3–8 cm long. *Spikelets* broadly ovate, with short acute apex. *First glume* absent. *Second glume* and lemma of lower floret distinctly 5-nerved, 3–4 mm long, pubescent on margins with long silky hairs. *Lemma* of upper floret broadly ovate or suborbicular.

Introduced from Uruguay or Argentina; now frequent in parts of southern USA and occasional in northern Mexico. BAJA CALIFORNIA NORTE: Roadside at San Antonio, N of Rosarito, 20 m, *Moran* 29742. Reported by Wiggins (1980:947) as occurring in ditches and waste ground of agricultural areas.

76. *Lasiacis* (Griseb.) Hitchc.

Shrubby or viney woody-stemmed perennials with much-branched culms, flat blades, and open

or less frequently contracted panicles. *Spikelets* ovoid or ellipsoid, placed obliquely on their pedicels, 2-flowered, the lower floret staminate or neuter, the upper perfect. *First glume* short, broad, often somewhat inflated. *Second glume and lemma of lower floret* about equal. *Lemma and palea of upper floret* indurate, white, the lemma margins in-rolled over edges of palea, both lemma and palea with tuft of hairs at the slightly indented apex.

This treatment is based on that of Gerrit Davidse (1978).

1. Blades linear to narrowly lanceolate, mostly less than 2 cm broad; spikelets obovate, mostly 3.7–4.3 mm long
..... 1. *L. divaricata*
1. Blades broadly lanceolate to ovate, mostly more than 2 cm broad; spikelets globose, mostly 2.8–3.8 mm long
..... 2. *L. ruscifolia*

1. ***Lasiacis divaricata* (L.) Hitchc. var. *divaricata*.** *L. divaricata* (L.) Hitchc., Contr. U.S. Natl. Herb. 15:16. 1910. *Panicum divaricatum* L. Fig. 76. Culms erect, much-branched, (0.5–) 1–5 (–7) m long, often viney and climbing over shrubs. *Sheaths* glabrous on back, less frequently pubescent, ciliate on upper margins and sometimes on collar, otherwise glabrous. *Ligule* a minute membranous collar. *Blades* (3–) 5–12 (–16) cm long, (0.3–) 0.6–1.4 (–2) cm broad, lanceolate or linear lanceolate, the surfaces glabrous except for some scabridity or puberulence along upper part of midrib. *Panicles* 2–12 (–20) cm long, the longer branches rather distant, usually reflexed, with few widely spaced spikelets. *Spikelets* (3.5–) 3.7–4.3 (–4.5) mm long, obovate.

Southern Florida to the Antilles, Mexico, and South America, on brushy slopes at low altitudes. BAJA CALIFORNIA SUR: Sierra de la Laguna (*Bran-degee* in 1890, cited by Hitchcock, 1913:252 and 1920:21, but not by Davidse, 1978).

2. ***Lasiacis ruscifolia* (H.B.K.) Hitchc. var. *ruscifolia*.** *L. ruscifolia* (H.B.K.) Hitchc., Proc. Biol. Soc. Wash. 24:145. 1911. *L. liebmannaiana* (E. Fourn.) Hitchc. *L. compacta* (Sw.) Hitchc. Plants robust, the culms 1–8 m long, erect at base, climbing and leaning on vegetation. *Sheaths* papillose-hispid with hairs to 3.5 mm long, glabrous or hispid, ciliate on margins above and often pubescent on collar. *Ligule* minute. *Blades* ovate, ovate-lanceolate, or occasionally narrowly lanceolate, (4–) 6–14 (–16) cm long and (1–) 1.8–4.4 (–5.6) cm broad, asymmetrical and cordate at base, glabrous or variously hairy. *Panicles* usually rather compact and dense, (2–) 4–16 (–22) cm long, usually with closely flowered branches, the lower 3 panicle branches



Fig. 76. *Lasiacis divaricata*: plant, spikelet, floret. From Hitchcock, 1935.

widely separated and widely spreading. *Spikelets* globose, (2.6–) 2.8–3.8 (–4) mm long.

Cuba, Jamaica, Mexico, and to northern South America, along shaded ravines, on brushy slopes, and in open forests. BAJA CALIFORNIA SUR: at 150–1600 m: Sierra de la Giganta (Arroyo Tabor; Arroyo Hondo); Cape region (San Antonio; San Bartolo; Sierra el Taste).

77. *Oplismenus* Beauv.

Perennials and annuals with usually weak decumbent branching culms, thin flat usually short blades, and inflorescences of few to several short spicate branches. *Spikelets* subsessile, paired or solitary in two rows on one side of a narrow scabrous or hairy rachis. *Spikelets* 2-flowered, the lower floret staminate or neuter, the upper perfect. *Lemma* of lower floret longer than glumes and lemma of upper floret, notched or entire, mucronate or short-



Fig. 77. *Oplismenus*: spikelet (left) and inflorescence of *O. burmannii*; spikelet (right) of *O. hirtellus*. From Pohl, 1980.

awned; lemma of upper floret firm, shiny, the margins inrolled over palea.

- | | |
|-----------------------------------|------------------------|
| 1. Awns smooth or minutely rugose | 1. <i>O. hirtellus</i> |
| 1. Awns antrorsely scabrous | 2. <i>O. burmannii</i> |

1. *Oplismenus hirtellus* (L.) Beauv., Ess. Agrost. 54, 168. 1812. *O. setarius* (Lam.) R. & S. Fig. 77. Annual (or perennial?) with trailing, branching culms. Erect flowering shoots mostly 15–30 cm tall. Culm nodes and upper part of internodes often pubescent or hirsute. Sheath margins and collar pilose or hispid; slender hispid auricles usually present. Ligule a fringed membrane usually 0.5–1 mm long. Blades glabrous, scabrous, or hispid, mostly 1.5–4 cm long and 4–10 mm broad. Panicle long-exserted, the main axis 2–6 (–8) cm long, with 3–6 (–8) spicate branches. Panicle branches 2–3 (–5) cm long, scabrous, puberulent or villous at base, usually with 3–8 spikelets. Glumes broad, appressed-hispid, short- to rather long-awned from usually notched apex, the first 3-nerved, the second 5-nerved. Lemma of lower floret 2–3 mm long, broad, glabrous or pilose, awnless or short-awned; lemma of upper floret firm, smooth, narrow, overlapping but not inrolled over margins of palea.

North Carolina, Florida, Arkansas, and Texas, south to Mexico, Honduras, the Antilles, and northern South America. BAJA CALIFORNIA SUR: Cape region: Sierra el Taste (Carter & Chisaki 3488).

We follow Davey and Clayton (1978) in reducing *O. setarius* to synonymy under *O. hirtellus*.

2. *Oplismenus burmannii* (Retz.) Beauv., Agrost. 54. 1812. *O. cristatus* Presl. Fig. 77. Annual with decumbent or trailing culms and erect flowering branches 10–40 cm tall. Sheaths glabrous or papillose-hispid, ciliate on margins and villous on collar. Ligule a short ciliate membrane. Blades mostly 2–6 cm long and 1–1.5 cm broad, usually undulate on margins. Panicle well-exserted, 2–5 (–10) cm long, the main axis usually hispid above lowermost branch. Panicle branches 3–8 or more, the rachis hispid with long stiff white hairs. Spikelets similar to those of *O. setarius*.

In both Old World and New World tropics; frequent from central Mexico, Cuba, and Hispaniola, to Brazil. BAJA CALIFORNIA SUR: Miraflores (Brandege 22 of 1890); Sierra de la Laguna (Brandege 5 of 1890)—both records cited by Hitchcock (1913:255) as *O. cristatus*.

78. *Echinochloa* Beauv.

Annuals and perennials with weak succulent culms and thin flat blades. Ligule a ring of hairs or absent. Inflorescence a panicle with few to many simple or rebranched densely flowered branches. Spikelets subsessile, disarticulating below glumes, 2-flowered, the lower floret staminate or neuter, the upper perfect. First glume present, short, acute or short-awned. Second glume and lemma of lower floret about equal, awned or awnless; lemma of upper (perfect) floret indurate, smooth and shiny, with margins inrolled over palea. Palea of upper floret similar to lemma in texture but narrowing to pointed tip free from lemma margins.

- | | |
|--|---------------------------|
| 1. Primary inflorescence branches simple, usually 2 cm or less long; spikelets 2.5–3 mm long, awnless, arranged in 4 regular rows on branch rachis; hairs of inflorescence axis, branches, and spikelets not papilla-based | 1. <i>E. colona</i> |
| 1. Primary inflorescence branches often rebranched, the lower branches commonly more than 2 cm long; spikelets small or large, awnless or awned, in regular rows or not; papilla-based hairs present on inflorescence branches or spikelets. | |
| 2. Lemma of upper (perfect) floret narrowly ovate or oblong; setae as long as or longer than spikelets not developed on inflorescence branches; panicle axis long, densely flowered, with numerous branches | 2. <i>E. crus-pavonis</i> |
| 2. Lemma of upper floret broadly ovate or oblong; setae | |

as long as or longer than spikelets present at least on lower inflorescence branches; panicle axis long or short, stiffly erect, with few to many branches

3. *E. crus-galli*

1. *Echinochloa colona* (L.) Link, Hort. Berol. 2:209. 1833. ARROZ DE MONTE, JUNGLE-RICE. Fig. 78. Tufted annual with slender weak culms 10–70 cm long. *Leaves* glabrous, without ligules, the blades thin, 3–6 (–9) mm broad, often with purple bars, v's, or blotches. *Inflorescence* short, few-flowered, with usually 3–7 unbranched primary branches; branches and nodes of axis glabrous or with a few hairs that are never papilla-based. *Spikelets* usually inconspicuously pubescent with fine short hairs. *Palea* of lower floret well developed.

Widespread in tropical and subtropical regions of both hemispheres, mostly as a weed of disturbed soils, as at roadsides and in gardens and waste places. BAJA CALIFORNIA NORTE: Occasional in the NW (Tijuana; Presa Rodríguez; Valle las Palmas; Santo Domingo); Mexicali. BAJA CALIFORNIA SUR: Common at relatively low elevations, known from many collections.

As explained by Hitchcock (1913:256, footnote), the epithet can be interpreted as a rare contracted form of the noun "colonorum", which would be invariable. However, W. D. Clayton (letter to Gould, November 1976) found that dictionaries of Linnaeus' day give "colonus" as a noun or adjective, suggesting that he may have used it here as an adjective and that, not knowing his intent, we may as well do likewise and so avoid the apparent discordance of "*Echinochloa colonum*".

2. *Echinochloa crus-pavonis* (H.B.K.) Schult., Mantissa 2:269. 1824. *E. sabulicola* (Nees) Hitchc. Annual with many-noded robust culms mostly 60–150 cm tall. *Ligule* absent. *Blades* long, mostly 1–2.5 cm broad, glabrous. *Panicles* 10–30 cm long, with lower branches to 14 cm long, the secondary branches to 3 cm; long setae absent to prominent on nodes of main panicle axis. *Spikelets* 2.8–3.1 mm long to base of awn. *Lower floret* neuter, the lemma awnless or with awn 1–11 mm long. *Lemma* of upper floret grayish, narrow, the coriaceous apex acute or obtuse, with well-differentiated membranous tip.

Southern United States and southward through the Antilles, Mexico, and Central and South America, to Bolivia and Argentina. BAJA CALIFORNIA SUR: Apparently not collected recently but known from three 19th century collections: San Ignacio (Brandegee in 1889); La Chuparosa (Brandegee in 1897); San José del Cabo (Purpus 286).



Fig. 78. *Echinochloa colona*: a, b, c, spikelet; d, sterile floret; e, f, fertile floret. From U.S.D.A. Bull. No. 7.

3. *Echinochloa crus-galli* (L.) Beauv., Ess. Agrost. 53, 161. 1812. Coarse annual with tufted erect or decumbent-spreading culms mostly 30–100 cm tall but occasionally much taller. *Culms* glabrous, with numerous usually swollen nodes. *Ligule* usually absent. *Blades* elongate, mostly 0.5–3 cm broad, scabrous or sparsely hirsute. *Panicles* mostly 10–25 cm long, with usually 5–25 appressed or spreading branches, the longer branches rebranched. *Main axis and branches* of panicle with stout often papilla-based setae that typically equal or exceed the spikelets in length. *Spikelets* awned or awnless, mostly 2.8–4 mm long. *Glumes* and *lemma* of lower



Fig. 79. *Rhynchelytrum repens*: plant, floret, spikelet. From Hitchcock, 1935.

floret, variously scabrous, hirsute or hispid to nearly glabrous. *Lower floret* neuter, the lemma awnless, short-awned, or with awn to 5 cm long, the awn length commonly but not always variable in same panicle. *Palea* of lower floret well-developed. *Lemma* of perfect floret broad, thick, with acute or obtuse tip separated by a line of minute bristles from a sharply differentiated withering membranous tip.

Widespread in temperate and subtropical regions of the world; in North America, where considered adventive, from Canada to Mexico, mostly as a weed of roadsides, ditches, field borders, and other areas of disturbed soil. BAJA CALIFORNIA NORTE: Fairly common in the NW (e.g. Tijuana; Ensenada; Maneadero; NE of Ojos Negros; Colonia Lazaro Cárdenas).

79. *Rhynchelytrum* Nees

1. *Rhynchelytrum repens* (Willd.) C. E. Hubb., Bull. Misc. Inf. 1934:110. 1934. *R. roseum* (Nees) Stapf & Hubb. *Tricholaena rosea* Nees. ZACATE NATAL, NATAL GRASS. Fig. 79. Perennial with spreading-erect culms mostly 30–70 (–100) cm tall. *Culm nodes* puberulent. *Leaves* usually somewhat papillose-hispid, occasionally only scabrous. *Ligule* a fringe of stiff hairs 0.5–1 mm long. *Blades* elongate, flat or folded, mostly 2–5 mm broad. *Inflorescence* an open or loosely contracted panicle mostly 6–20 cm long, with slender curving branches and pedicels and villous rosy spikelets, fading white. *Disarticulation* at base of spikelets. *Spikelets* 2-flowered, the lower floret sterile, the upper perfect. *First glume* minute, the second glume and lemma of lower floret equal and similar, about 4 mm long, with slender terminal awn mostly 1.5–2 mm long, densely pubescent with silky hairs 5–10 mm long. *Lemma* of upper floret glabrous, shiny, slender and pointed, 2–2.5 mm long.

An African grass now well established and somewhat weedy in warmer parts of the Americas, mainly on roadsides, field borders, and other moderately disturbed and well drained soils. BAJA CALIFORNIA NORTE: Still uncommon in the NW, noted only along main highways (Presa Rodríguez; W of Tecate; Medio Camino; N of Sauzal). BAJA CALIFORNIA SUR: Cape region (La Paz; San Antonio; San Bartolo; Santiago; Miraflores; Caduaño; San José del Cabo).

80. *Setariopsis* Scribn.

1. *Setariopsis auriculata* (E. Fourn.) Scribn. in Millsp., Publ. Field Columbian Mus., Bot. Ser. 1:289. 1896. Fig. 80. Erect or ascending somewhat branching annual 20–60 cm tall. *Sheaths* compressed, pubescent. *Blades* flat, 4–15 cm long, 3–12 mm wide, pubescent. *Panicle* subspicate, 3–15 cm long, the primary and secondary branches each ending in a flexuous bristle to 10 mm long. *Spikelets* short-pedicel, 3–4 mm long. *First glume* 5–7-nerved, ca. $\frac{1}{4}$ as long as spikelet. *Second glume* 11–15-nerved, broadly ovate, irregularly auriculate, saccate. *Sterile lemma* longer and narrower than second glume, acute, indurated on margins. *Fertile lemma* ovate, acute, transversely rugose.

Grassy plains at low elevations, Sonora and Chihuahua to northern South America. BAJA CALIFORNIA SUR: With *Pachycereus* and *Fouquieria*, 3 km S of Miraflores, 275 m (Reeder & Reeder 6601).

Reported for Baja California by Reeder and Reeder (1981:556), who kindly sent us the details.

81. *Setaria* Beauv.

Annuals and perennials with erect or spreading-erect culms from decumbent base. *Ligule* a short fringed membrane. *Blades* thin, flat or infrequently involute, narrow or broad, in subgenus *Ptychophyllum* very broad, plicate, and petiolate. *Inflorescence* a narrow usually densely flowered bristly panicle, the spikelets sessile on main axis and on short erect or spreading branches. Some or all spikelets subtended by 1 to several persistent bristles (reduced branches or pedicels), the spikelets disarticulating above bristles. *Spikelets* 2-flowered, the lower floret staminate or neuter, the upper perfect. *Glumes* unequal, the first less than $\frac{1}{2}$ length of spikelet, the second more than $\frac{1}{2}$ length of spikelet. *Lemma* and *palea* of upper floret indurate, usually finely to coarsely rugose, rounded at apex, the lemma margins thick and inrolled over palea margins.

This treatment is based mainly on the monograph of North American species by Rominger (1962).

1. Bristles 4–12 below each spikelet; plants perennial from hard knotty rhizomatous base 1. *S. geniculata*
1. Bristles 1–3 below each spikelet; plants annual or perennial.
2. Bristles retrorsely scabrous or scabrous-hispid; plants annual 2. *S. adhaerans*
2. Bristles smooth or antrorsely scabrous.
3. Plants perennial from firm, often hard, base.
4. Margins of sheath ciliate-pubescent, at least above; ligular hairs to 4 mm long.
5. Palea of lower floret nearly as long as palea of upper floret; spikelets mostly 1.9–2.1 mm long at maturity, strongly inflated and appearing globose; blades, at least some, 7–15 mm broad 4. *S. macrostachya*
5. Palea of lower floret usually $\frac{1}{2}$ – $\frac{3}{4}$ as long as palea of upper floret; spikelets mostly 2.1–2.7 mm long, not strongly inflated; blades 2–5 (–7) mm broad 6. *S. leucopila*
4. Margins of sheath glabrous; ligular hairs 0.2–1 mm long 5. *S. palmeri*
3. Plants annual.
6. Panicle dense, cylindrical and spicate, the primary panicle axis usually not visible for most of its length; lemma of upper floret minutely rugose.
7. Panicle axis scabrous-hispid with short stiff hairs of uniform length; panicle branches densely verticillate 3. *S. verticillata* var. *ambigua*
7. Panicle axis scabrous and with long and short hairs; panicle branches not densely verticillate 7. *S. viridis*
6. Panicle contracted but relatively loose, the main axis visible for most of its length.
8. Lemma of upper (perfect) floret finely reticulate or minutely rugose 8. *S. grisebachii*



Fig. 80. *Setariopsis auriculata*: plant, spikelet, inflorescence. From Swallen, 1955.

8. Lemma of upper floret coarsely transverse-rugose 9. *S. liebmannii*

1. *Setaria geniculata* (Lam.) Beauv., Ess. Agrost. 51, 178. 1812. *Chaetochloa imberbis* (Poir.) Scribn. *C. gracilis* (H.B.K.) Scribn. & Merr. PAJITA CERDOSA, KNOTROOT BRISTLEGRASS. Perennial with tufted culms 30–100 cm or more tall from short knotty rhizomes. *Nodes* glabrous. *Leaves* usually glabrous or inconspicuously scabrous, sometimes with a few long hairs above ligule. *Blades* flat, mostly 2–8 mm broad. *Panicles* densely flowered, cylindrical, the puberulent main axis obscured by spikelets. *Bristles* antrorsely scabrous, yellow, tawny, green, or purple, variable in length but mostly 5–10 mm long. *Spikelets* 2.5–3 mm long, elliptical, turgid. *Lower floret* with lemma about as long



Fig. 81. *Setaria macrostachya*: plant, spikelet with fertile floret removed, pedicelled spikelet with bristle at base. From Gould, 1951.

as lemma of upper floret and palea about equal to lemma in length. *Lemma* of upper (perfect) floret coarsely transverse-rugose.

As reported by Rominger (1962), this is the widest spread species of *Setaria* in North America, ranging from northern USA through Mexico and the Antilles and to South America. Its apparent infrequency in Baja California is therefore surprising. BAJA CALIFORNIA SUR: Reported by Hitchcock (1913:264) from San José del Cabo (Brandeggee 15 of 1890, *Purpus* 325).

2. *Setaria adhaerans* (Forssk.) Chiov., Nuovo. Giorn. Bot. Ital. 26:77. 1919. Annual with weak, often geniculate or trailing culms 25–70 cm in height or length. *Nodes* glabrous, dark colored. *Sheaths* glabrous, with hyaline margins. *Blades* thin, flat, usually rather short, 5–13 mm broad, glabrous to strigose and often with papilla-based hairs. *Inflorescence* dense, cylindrical, the main axis obscured by spikelets, 2–6 (–8) cm long and usually 4–6 mm broad excluding awns. *Bristles* typically 1 below each spikelet, retrorsely scabrous or scabrous-hispid at least at tip, about equalling or greatly ex-

ceeding spikelet in length. *Spikelets* 1.5–1.8 (–2) mm long, oblong-elliptic. *Palea* of lower floret less than $\frac{1}{2}$ lemma length. *Lemma* and *palea* of upper floret finely rugose.

Tropical regions of the world, a weedy grass of disturbed habitats; in the Americas from southern USA through Mexico and the Antilles to South America. BAJA CALIFORNIA NORTE: Ensenada; N of Maneadero; Ejido Papalote. BAJA CALIFORNIA SUR: Villa Constitución (El Crucero); 114 km NW of La Paz; La Paz.

Setaria adhaerans is closely related to *S. verticillata*, and the two are not always readily separable.

3. *Setaria verticillata* (L.) Beauv. var. *ambigua* (Guss.) Parl., Fl. Palerm. 1:36. 1845. Tufted annual with erect or decumbent branching culms to 80 cm or more long. *Nodes* glabrous, brownish-black. *Ligule* a fringe of hairs 1–2 mm long. *Blades* flat, 5–15 mm broad, scabrous, sparsely hispid on one or both surfaces. *Panicles* dense, cylindric, mostly 4–15 cm long, tending to be lobed or interrupted below middle. *Bristles* short, mostly 4–7 mm long, antrorsely scabrous. *Spikelets* oblong-elliptic, mostly 2–2.2 mm long. *Palea* of lower floret ca. $\frac{1}{2}$ as long as lemma. *Lemma* of upper (perfect) floret finely transverse-rugose.

Adventive from Europe, a weed of disturbed soils in Canada, USA, and northern Mexico. BAJA CALIFORNIA NORTE: La Mesa, SE of Tijuana (Moran 18580); Ensenada (Wiggins & Thomas 420).

Setaria verticillata var. *ambigua* differs from the typical variety in having antrorsely rather than retrorsely scabrous bristles, and usually longer ligules. From *S. viridis*, with which it is sometimes confused, it can be distinguished by the longer hairs on the panicle axis, the verticiled panicle branches, and the hispid blades.

4. *Setaria macrostachya* H.B.K., Nov. Gen. Sp. 1:110. 1815. PAJITA TEMPRANERA, ZACATE TEMPRANERO. Fig. 81. Cespitose perennial with strictly erect or geniculate-spreading culms mostly 60–120 cm tall. *Ligule* a dense ring of hairs 2–4 mm long. *Blades* flat, mostly 7–15 mm broad, scabrous on adaxial surface. *Panicles* densely flowered, cylindrical, 10–30 cm long, 1–2 cm thick, with scabrous, sparsely hirsute axis. *Bristles* usually 10–20 mm long, solitary below each spikelet. *Spikelets* globose at maturity, mostly 1.9–2.1 mm long. *Palea* of lower floret well-developed, nearly as long as lemma. *Lemma* of upper (perfect) floret coarsely rugose.

Open rocky hills and plains and brush-covered slopes, Arizona, New Mexico, and southern Texas, to central Mexico. BAJA CALIFORNIA SUR: Sierra de la Giganta, 200–750 m (Valle de los Encinos; Parras; Arroyo Tabor); Cape region (San Bartolo).

Relationships of this and the following two species, *S. palmeri* and *S. leucopila*, need further investigation before a completely satisfactory taxonomic disposition of the group can be made.

5. *Setaria palmeri* Henr., *Blumea* 3:415. 1940. Based on *Chaetochloa rigida* Scribn. & Merr., not Stapf. Cespitose perennial with strictly erect or spreading-erect culms mostly 30–100 cm tall. Similar to *S. macrostachya* but with ligules 1 mm or less long and sometimes appearing absent, sheaths glabrous on margins, bristles mostly 5–9 mm long, and spikelets often to 2.5 mm long.

Dry rocky slopes and ravines, endemic to central and southern Baja California. BAJA CALIFORNIA SUR: San Ignacio; Bahía Pulpito; Sierra de la Giganta; between Santo Domingo and La Paz; Los Aripes; La Paz (*Palmer 125*, the type collection); Cape region (Todos Santos; San Pedrito; Los Frailes; San José del Cabo; Cabo San Lucas).

6. *Setaria leucopila* (Scribn. & Merr.) K. Schum., *Just's Bot. Jahresb.* 28:417. 1902. PLAINS BRISTLE-GRASS. Cespitose perennial similar to *S. macrostachya* but leaf blades 2–5 (–7) mm broad, and spikelets mostly 2.1–3 mm long.

Rocky slopes and stream courses with well drained soils having an occasional abundance of moisture, Colorado, Arizona, New Mexico, and Texas, to central Mexico. BAJA CALIFORNIA NORTE: Sierra Juárez (Portezuelo de Jamaú, 1300 m); Cañón San Simón, 100 m; Sierra San Borja (Cerro la Chona, 1200 m). BAJA CALIFORNIA SUR: Cape region (San Bartolo); Islas San Marcos, San Ildefonso, and Santa Catalina.

7. *Setaria viridis* (L.) Beauv., *Ess. Agrost.* 51. 171. 178. 1812. GREEN BRISTLEGRASS. Tufted annual with weak erect or geniculate culms 20–80 cm tall. *Nodes* glabrous or the lowermost bearded. *Sheaths* pilose on margins and occasionally on back. *Ligule* a fringed membrane 1–2 mm long. *Blades* flat or folded, mostly 3–10 mm broad, glabrous or scabrous. *Panicles* dense, usually green, 2–15 cm long. *Bristles* antrorsely scabrous, usually green, 5–20 mm long. *Spikelets* 1.8–2.6 mm long. *Palea* of lower floret variable, from vestigial to $\frac{2}{3}$ as long as lemma of lower floret. *Lemma* of upper floret finely rugose, not wrinkled.

Widespread in temperate regions and occasional in subtropics, apparently introduced in North America, where it is a weed of fields and waste places. BAJA CALIFORNIA NORTE: Roadside SE of Valle las Palmas, 350 m (*Moran 25134*); Rancho San José, Sierra San Pedro Mártir, 650 m (*Moran 15313*).

8. *Setaria grisebachii* E. Fourn., *Mex. Pl.* 2:45. 1886. GRISEBACH BRISTLEGRASS. Annual with erect or geniculate-spreading culms 40–60 (–100) cm tall. *Nodes* hirsute. *Sheaths* pilose on upper margins and often on back. *Ligule* hairs ca. 1 cm long. *Blades* thin, flat, at least some elongate, mostly 5–13 cm broad, usually short-hispid on one or both surfaces. *Panicles* variable, typically 3–18 cm long and rather thinly flowered, the main axis readily visible on most panicles. *Panicle axis* scabrous-hispid and hirsute. *Bristles* minutely scabrous, 0.5–2 cm long, usually single below spikelet. *Spikelets* ovate, 1.6–2.2 mm long. *Palea* of lower floret usually ca. $\frac{1}{3}$ as long as lemma; lemma and palea of upper floret minutely rugose.

Rocky slopes, washes, and gravelly plains, Arizona, Oklahoma, and Texas, through Mexico and the Antilles, to Central America. BAJA CALIFORNIA SUR: Summit of Cerro Azufre, 1650 m; Volcán las Tres Vírgenes, 1150 m; Sierra de la Giganta, 350–1250 m (Cerro del Barreno; San Javier; Última Agua; Arroyo Tabor; Soledad); E of Villa Constitución; Todos Santos; Santa Rosa.

9. *Setaria liebmännii* E. Fourn., *Mex. Pl.* 2:44. 1886. Annual with culms mostly 20–75 cm tall, generally similar to *S. grisebachii*, but lemma of upper floret deeply transverse-rugose (ridges and furrows of mature grain often evident through second glume and lemma of lower floret), panicles larger and looser, herbage more glabrous, blades broader, and palea of lower floret completely reduced.

Open grassy plains, rocky slopes, and sheltered ravines and arroyos, southern Arizona through western and southern Mexico to Costa Rica. BAJA CALIFORNIA SUR: W of San José de Magdalena, 320 m; Sierra de la Giganta, 100–750 m (Arroyo Gua; Valle de los Encinos; Portezuelo de la Cuesta de los Dolores); La Paz; Cape region, to 600 m (Triunfo; San Antonio; W of San Bartolo; Miraflores).

According to Beetle (1977a:394), *Setaria palmifolia* (Koen.) Stapf is cultivated in Baja California Sur. It is a tall perennial from India, grown as an ornamental, with leaves to 50 cm long and 6 cm wide.



Fig. 82. *Cenchrus*: A, *C. incertus*: plant, flower cluster (bur), spikelet. B, *C. myosuroides*: bur. C, *C. echinatus*: bur. From Gould and Box, 1965.

82. *Cenchrus* L.

Annuals with weak decumbent branching culms, and a few perennials of diverse habit. *Ligule* a fringed membrane mostly 0.5–3 mm long. *Inflorescence* contracted, spikelike, with spikelets enclosed in bristly subsessile deciduous burs, with 1–8 spikelets in each bur. *Burs* formed by bristles and/or flattened spines (modified branchlets) fused together at least at base, the bristles and spines usually retrorsely barbed. *Spikelets* 2-flowered, the lower floret staminate or neuter, the upper perfect. *Glumes* thin, membranous, unequal. *Lemma and palea* of lower floret membranous, ca. equal; lemma of upper floret thin, membranous, tapering to slender, usually acuminate tip, the margins not inrolled. *Caryopsis* dorsally flattened.

1. Burs with bristles only, lacking stiff flattened spines with flattened bases; plants perennial.
2. Bristles retrorsely scabrous 1. *C. myosuroides*
2. Bristles conspicuously ciliate-pubescent 6. *C. ciliaris*
1. Burs with bristles and stiff spines with flattened bases; plants annual or weakly perennial.
3. Burs consisting of several whorls of united, flattened spines, the spines emerging at irregular intervals throughout body of bur.
4. Spines of bur 8–40, 2–5 mm long; bur with 2–4 spikelets 2. *C. incertus*

4. Spines 40–65, 9–14 mm long; bur with 4–8 spikelets 3. *C. palmeri*
3. Burs consisting of one whorl of united flattened spines subtended by one to several whorls of smaller, finer bristles.
5. Burs loosely spaced on rachis; outer bristles mostly about $\frac{1}{2}$ length of inner spines of bur; peduncle more than 2 mm wide 4. *C. echinatus*
5. Burs closely spaced on rachis; outer bristles equalling or slightly exceeding inner spines of bur; peduncle about 2 mm wide 5. *C. brownii*

1. *Cenchrus myosuroides* H.B.K., Nov. Gen. Sp. 1:115. 1815. BIG SANDBUR. Fig. 82B. Coarse perennial with stout culms in large clumps. *Culms* mostly 0.7–2 m tall, little-branched above base, more or less woody in age. *Blades* elongate, 4–13 mm broad, scabrous and occasionally sparsely pilose. *Inflorescence* mostly 8–20 cm long and 6–12 mm thick. *Spikelets* usually only 1 per bur. *Bristles* irregular in length, fused below into hard conical base. *Spikelets* mostly 4–5 mm long.

Brushy ravines, ditches, and stream courses, SE USA through Mexico and the Antilles to southern South America. BAJA CALIFORNIA SUR: Comondú (Brandege in 1889, cited by Hitchcock, 1913:268).

2. *Cenchrus incertus* M. A. Curtis, Boston J. Nat. Hist. 1:135. 1837. *C. pauciflorus* Benth., Bot. Voy. Sulphur 56. 1844. ABROJO ROSETA, CADILLO DE PLAYA, SANDBUR, GRASS-BUR. Fig. 82A. Annual or short-lived perennial with erect or more commonly decumbent and spreading culms mostly 8–80 cm long. *Sheaths* laterally compressed, glabrous or sparsely pilose. *Blades* thin, flat, usually glabrous, mostly 2–6 mm broad. *Inflorescence* 1.5–8 (–9) cm long, the rachis with internodes 2–5 mm long. *Burs* variable, ovoid to globose, 2–5 mm long, pubescent or less often glabrous, usually with 8–40 retrorsely barbed spines. *Spikelets* 2–4, usually 3, per bur, mostly 3.5–5.8 mm long.

Southern USA through Mexico and the Antilles to Central and northern South America, a common weed of disturbed soils, in Baja California at low elevations. BAJA CALIFORNIA SUR: Comondú; Loreto; Bahía Magdalena; Santa Rita; Triunfo.

The type of *C. pauciflorus* was collected by Barclay at Bahía Magdalena.

3. *Cenchrus palmeri* Vasey in Brandege, Proc. Calif. Acad. Sci., Ser. 2, 2:211. 1889. HUISAPOL, PALMER SANDBUR. Short-lived annual with much-branched, decumbent-spreading culms mostly 9–35 cm long. *Sheaths* slightly compressed, puberulent. *Blades* thin, mostly 3.8–6.8 mm broad. *Inflorescence* with 1–4, usually 3, large purple or occasionally yellow burs; base of bur rounded, densely pu-

bescent. *Spikelets* 5.2–7.3 mm long. *First glume* absent or greatly reduced, the second 4.5–6.4 mm long, 5-nerved. *Lemna* of lower floret 4.5–6.5 mm long, the palea ca. as long. *Upper (perfect) floret* 5.2–7.1 mm long.

Endemic to Baja California and Sonora, in sandy soil at low elevations. BAJA CALIFORNIA NORTE: San Felipe; Puerto Santa Catarina; Bahía de los Ángeles; Isla San Lorenzo. BAJA CALIFORNIA SUR: Common, collected many places throughout the state; Islas San Marcos, Coronados, Carmen, Danzante, Monserrate, San José, San Francisco, and Espíritu Santo.

This readily recognizable sandbur is one of the most distinct of the genus and is one of very few grasses endemic to the Sonoran Desert. In commenting on its adaptation to desert conditions, De Lisle (1963) noted that plants grown in the greenhouse, in contrast to other species, matured in 3 or 4 weeks, often with mature inflorescences when only a few inches high.

4. *Cenchrus echinatus* L., Sp. Pl. 1050. 1753. CADILLO AUSTRAL, HUISAPOL, ABROJO, SOUTHERN SANDBUR. Fig. 82C. Annual with culms usually geniculate or trailing, the erect tips mostly 15–40 cm tall, the trailing culms to 85 cm long. *Sheaths* laterally compressed, pilose on margins. *Blades* thin, 3–12 mm broad, glabrous to variously pubescent. *Inflorescence* mostly 3–8 (–10) cm long and 0.8–1.2 cm thick. *Burs* 5–10 mm long, usually purple-tinged, the spines and bristles retrorsely barbed. *Spikelets* 5–7 mm long, 2–3 per bur. *Lemna* of upper floret slightly longer than lemma of lower floret and second glume.

Southern USA through Mexico and much of South America, a weed of disturbed soils. BAJA CALIFORNIA NORTE: N of Sauzal on Tecate road, 50 m (Moran 25102). BAJA CALIFORNIA SUR: Santa Rosalía; La Purísima; NW of Mulegé; La Paz; San José del Cabo.

5. *Cenchrus brownii* R. & S., Syst. Veg. 2:258. 1817. CADILLO AGLOMERADO. Annual with weak usually branching and decumbent or trailing culms mostly 25–90 cm long. *Sheaths* often somewhat laterally compressed, ciliate on margins. *Blades* flat, thin, 4–11 mm broad. *Inflorescence* brownish, closely flowered, 3–12 cm long and ca. 1.5 cm thick. *Rachis* slightly angled, puberulent, the internodes 0.8–1.7 mm long. *Bur* globose, 5–8 mm long and 2–4.5 mm thick including outer bristles, with retrorsely barbed spines and bristles. *Inner spines* fused to form cup, erect or interlocking at maturity,



Fig. 83. *Anthephora hermaphrodita*. From Swallen, 1955.

2–4 mm long. *Outer spines* numerous, bristle-like, arising in whorl at base of bur, sometimes surpassing inner spines. *Spikelets* 2–3 per bur, 4–6 mm long. *First glume* 0.5–2.5 mm long, 1-nerved, the second 2.2–4.9 mm long, 3–5-nerved. *Lemna of lower floret* 3.5–5.5 mm long, enclosing long narrow palea. *Upper floret* 3.6–5.4 mm long.

Southern tip of Florida through the Antilles to southern Mexico, central America, and northern South America, usually a weed of sandy or disturbed loose soils at low elevations. BAJA CALIFORNIA SUR: Loreto; between Loreto and San Javier; Coromuel, near La Paz; La Paz.

6. *Cenchrus ciliaris* L., Mant. 302. 1771. *Pennisetum ciliare* (L.) Link. ZACATE BUFFEL, BUFFELGRASS. Perennial with erect or geniculate-spreading branched culms hard and knotty at base. *Sheaths* laterally compressed and keeled, pilose or not. *Blades* thin, scabrous or sparsely pilose, 2.5–8 mm broad. *Inflorescence* dense, cylindrical, 4–10 (–13) cm long, 1–2 cm thick. *Bristles* 4–10 mm long, purplish, long-ciliate on inner margins, terete, connate only at base or slightly above. *Burs* with 2–4 spike-



Fig. 84. *Imperata brevifolia*. From Hitchcock, 1935.

lets, attached by a minute pilose peduncle. *Spikelets* 2.2–5.6 mm long. *Lemma* of upper floret 2.2–5.4 mm long.

Native to warmer parts of Africa, India, and Madagascar; introduced as a forage grass in southern USA and Mexico. BAJA CALIFORNIA SUR: La Solidar, S Sierra de la Giganta; 65 km NW of La Paz; La Paz.

83. *Antheophora* Schreb.

1. *Antheophora hermaphrodita* (L.) Kuntze, Rev. Gen. Pl. 2:759. 1891. Fig. 83. Tufted annual with culms usually geniculate-spreading at base, 10–60 (–100) cm tall. *Sheaths and blades* usually hispid. *Ligule* a rounded or truncate erose membrane 1–2 mm long. *Blades* thin, flat, short, mostly 3–8 mm broad. *Inflorescence* slender, spikelike, mostly 4–9 cm long and 3–4 mm broad, with spikelets in subsessile readily deciduous burlike clusters of 4, on zigzag rachis mostly 3–10 cm long. *Spikelet clusters* or “burs” fused together at base and oriented with the large broad indurate first glumes facing outward. *Spikelets*: two represented by glumes only, the other two 2-flowered, with lower floret reduced and neuter and upper perfect. In spikelets with florets, lemma of lower floret a membranous scale and lemma and palea of upper floret also relatively thin. *Caryopsis* broadly elliptical, 1.5–2 mm long.

A weedy tropical grass occurring from Mexico to Brazil, mostly in loose sandy soil in disturbed sites. BAJA CALIFORNIA SUR: Punta Conejo; La Paz; San Pedro; Todos Santos; Triunfo; San Bartolo; Los Frailes; San José del Cabo; Cabo San Lucas.

Tribe 19. Andropogoneae

84. *Imperata* Cyrillo

1. *Imperata brevifolia* Vasey, Bull. Torrey Bot. Club 13:26. 1886. *I. hookeri* Rupr. ex Hack. SATINTAIL. Fig. 84. Stout perennial with erect culms mostly 1–1.5 m tall from scaly rhizomes. *Leaves* mostly clustered towards base of culms, the sheaths smooth and in age fibrous. *Sheaths* rounded, often auriculate at apex. *Blades* flat, mostly 15–40 cm long and 6–12 mm broad, hirsute on adaxial surface near base. *Panicles* dense, contracted, mostly 15–30 cm long, usually 2–3 cm thick, the spikelets more or less obscured by long silky hairs. *Spikelets* all alike, awnless, with single perfect floret and reduced floret below, mostly 3.5–4.5 mm long, unequally pediceled in pairs on slender continuous branch rachis. *Glumes* ca. equal, membranous.

Lemma of lower floret and lemma and palea of upper floret thin and hyaline.

Utah and Nevada to southern California, Texas, and western Mexico, on open slopes and in canyon bottoms at low to moderately high elevations. BAJA CALIFORNIA NORTE: Canyons on E side of Sierra Juárez (Cañon Tajo) and Sierra San Pedro Mártir (Cañon la Providencia, 620 m). BAJA CALIFORNIA SUR: Arroyo Tabor, Sierra de la Giganta, 380 m.

85. *Saccharum* L.

1. *Saccharum officinarum* L., Sp. Pl. 54. 1753. CAÑA DE AZÚCAR, SUGAR CANE. Fig. 85. Stout rhizomatous perennial with thick succulent many-jointed culms as much as 4–5 m tall. *Sheaths* overlapping, rounded, glabrous, soon deciduous. *Blades* long and flat, to 5 cm broad. *Inflorescence* a large densely flowered plume-like panicle 20–60 (–100) cm long, silvery-hairy, with numerous long slender racemose branches. *Branch rachis* readily disarticulating at nodes at maturity. *Spikelets* 2-flowered, the upper floret perfect, the lower neuter, 3–4 mm long, with basal tuft of silky hairs 2–3 times as long as spikelets. *Glumes* ca. equal, membranous. *Lemma* of lower floret and lemma and palea of upper floret, thin and hyaline. *Chromosome number*, $2n = 20$.

Originally from tropical SE Asia, now grown in the tropics and subtropics of the world. BAJA CALIFORNIA SUR: Grown on small scale or commercially, from Mulegé to Cape region.

This species and its hybrid derivatives supply about two-thirds of the world's commercial sugar.

86. *Sorghum* Moench

Annuals and perennials, with usually tall thick succulent culms and broad flat blades. *Inflorescence* an open or contracted panicle, the spikelets clustered on short racemose branchlets. *Spikelets* in pairs of one sessile and perfect and one pedicel and staminate or neuter, at branch tips the sessile spikelet associated with 2 pedicel spikelets. *Glumes* broad, coriaceous, ca. equal in length, lanceolate. *Lemma* of lower floret and lemma and palea of upper floret thin and hyaline, awned or awnless.

- | | |
|---|------------------------|
| 1. Plants annual, without rhizomes | 1. <i>S. bicolor</i> |
| 1. Plants perennial, with thick fleshy or firm rhizomes | 2. <i>S. halepense</i> |

1. *Sorghum bicolor* (L.) Moench, Meth. Pl. 207. 1794. *S. vulgare* Pers. MILO MAÍZ, SORGO, SOR-



Fig. 85. *Saccharum officinarum*: plant, panicle branches, spikelet with pedicel and rachis joint. From Hitchcock, 1935.

GHUM. Large succulent annual with culms mostly 0.8–2.5 m tall and with usually long thin blades 1–5 cm or more broad. *Inflorescence* highly variable, usually a compact panicle 10–20 cm long, with thick short branches and pedicels, and with awnless spikelets 4–6 mm long. *Glumes* pubescent, usually with shiny glabrate spot on the rounded back.

An Old World grass with many varieties widely used for grain or forage; grown commonly in southern USA and sometimes in Mexico. BAJA CALIFORNIA NORTE: Occasional as a roadside escape in the NW but probably not persisting (Presa Rodríguez; grade E of Rumorosa, 675 m; S of Colonet).

2. *Sorghum halepense* (L.) Pers., Syn. Pl. 1:101. 1805. ZACATE JOHNSON, JOHNSON GRASS. Fig. 86. Coarse succulent perennial with culms in small clumps from thick creeping rhizomes. *Culms* most-



Fig. 86. *Sorghum halepense*: plant, two views of terminal raceme. From Hitchcock, 1935.

ly 1–2 m tall but shorter in dry or otherwise unfavorable sites. *Ligule* a truncate ciliate membrane. *Blades* large, elongate, usually glabrous, usually 0.8–1.5 (–2) cm broad. *Panicles* typically 15–35 cm long, open and freely branched, the branchlets and spikelets tending to be appressed along primary branches. *Perfect (sessile) spikelets* 4.5–5 mm long, awnless or with delicate geniculate readily deciduous lemma awn. *Glumes* nerveless and shiny, puberulent at least on margins. *Lemma body* thin and membranous, the awn when present 1–1.5 mm long, with twisted lower segment. *Pediceled spikelets* usually as long as or longer than sessile ones but narrower and thinner. *Caryopsis* 2–3 mm long.

Native to the Old World; now common through-



Fig. 87. *Andropogon glomeratus*: inflorescence. From Gould and Box, 1965.

out temperate and warm regions, cultivated as a forage grass but more common as a weed of roadsides, ditches, and moist waste areas. BAJA CALIFORNIA NORTE: Occasional at roadsides in the NW, to 1200 m (Tijuana airport; Presa Rodríguez; SE of La Hechicera; Los Cantiles; La Misión; NE of Eréndira); planted for forage and also a common weed, Valle de Mexicali. BAJA CALIFORNIA SUR: SE of La Paz.

87. *Andropogon* L.

1. *Andropogon glomeratus* (Walt.) B.S.P., Prel. Cat. N.Y. 67. 1888. BUSHY BLUESTEM. Fig. 87. Perennial with culms often in dense clumps, mostly 75–150 cm tall. *Lower sheaths* broad and overlapping, strongly compressed laterally and keeled dorsally. *Ligule* a stiff membrane 0.5–1 mm long. *Blades* flat or folded, 2.5–6 (–8) mm broad, usually narrower than sheaths. *Flowering culms* profusely branched and rebranched, the ultimate branches broom-like with their congested reduced villous inflorescences. *Uppermost branchlets* villous, at least below nodes. *Bracteate sheaths* subtending inflorescences slightly inflated, typically reddish-brown. *Inflorescence branches* usually 2, each 1.5–3 cm long, delicate, usually slightly shorter than

subtending sheath and partially enclosed by it. *Spikelets* in pairs of one sessile and perfect and one pediceled and rudimentary, or the pediceled sometimes absent. *Sessile spikelets* usually 3–4.5 mm long, with single well-developed floret. *Glumes* firm, subequal, as large as spikelet. *Lemma* with delicate undulant but not geniculate awn 1–2 cm long.

Connecticut, Oklahoma, and California, through Mexico, the Antilles, and Central America; in Baja California along streams. BAJA CALIFORNIA NORTE: E side of Sierra Juárez (Cañón Tajo; Cañón Guadalupe); E side of Sierra San Pedro Mártir (Cañón del Diablo; Cañón la Providencia), less common on W side (Arroyo la Grulla, 900 m); ex-misión Santa María, 550 m. BAJA CALIFORNIA SUR: Hitchcock (1913:205) reported Brandegeе collections from Sierra San Francisquito and from W side of Cape region mountains.

88. *Bothriochloa* Kuntze

1. *Bothriochloa barbinodis* (Lag.) Herter var. *barbinodis*. *B. barbinodis* (Lag.) Herter, *Revista Sudamer. Bot.* 6:135, 1940. *Andropogon barbinodis* Lag. POPOTILLO ALGODONOSO, CANE BLUESTEM. Fig. 88. Cespitose perennial, the culms often in large clumps. *Culms* mostly 60–120 cm tall. *Culm nodes* bearded with white hairs mostly 1–3 mm long. *Leaves* essentially glabrous except for a few hairs above ligule. *Ligules* membranous, 1–2 mm long. *Blades* firm, linear, 2–7 mm broad. *Panicles* mostly 7–13 cm long, often partially included in upper sheath, with erect-spreading branches mostly 3–9 cm long, the lower ones often rebranched. *Pedicels and upper rachis* joints with broad membranous central area. *Spikelets* in pairs of one sessile and one pediceled, the sessile one perfect and awned, the pediceled one staminate or neuter, reduced in size, and awnless. *Sessile (perfect) spikelet* more or less triangular, 4.5–7.3 mm long (excluding awn). *First glume* large, firm, sparsely hairy below middle. *Lemma* awn 20–30 mm or more long, geniculate and twisted.

Dry rocky slopes and plains and dry arroyo beds. Utah and Colorado to southern California, Texas, and Mexico; also Uruguay and Argentina. BAJA CALIFORNIA NORTE: Along NW coast (Medio Camino; Arroyo Jatay; Arroyo Hediondo; Arroyo Socorro); Sierra Juárez, 1000–1300 m (Pino Solo; Cañada el Rincón; El Rodeo; Portezuelo de Jamaú); E side of Sierra San Pedro Mártir, ca. 700–800 m (Cañón del Diablo; Cañón Teledo). BAJA CALIFOR-



Fig. 88. *Bothriochloa barbinodis* var. *barbinodis*: panicle, spikelet pair. From Gould and Box, 1965.

NIA SUR: Cerro Azufre, 1650 m; Cerro la Laguna, Sierra San Francisco, 1450 m; Sierra de la Giganta (Arroyo Tabor, 380 m; Arroyo el Coyote, 460 m); Cape region (El Taste).

In *B. barbinodis* var. *perforata* (Trin. ex E. Fourn.) Gould the first glume in most or all sessile spikelets has a glandular pit at or above the middle, whereas in var. *barbinodis* such a pit is lacking in most or all spikelets. Although one collection (Cerro Azufre, *Moran 18735*) has a few glumes glandular pitted, the Baja California collections all seem referable to var. *barbinodis*.



Fig. 89. *Schizachyrium cirratum*. From Hitchcock, 1935.

89. *Schizachyrium* Nees

Annuals and perennials, with or without rhizomes. *Leaves* with rounded or compressed and keeled sheaths. *Ligules* membranous. *Flowering culms* much-branched above, with each leafy branch or branchlet terminating in a single spicate raceme with stout or slender rounded rachis. *Spikelets* in pairs of one sessile and perfect and one pediceled and staminate or neuter. *Disarticulation* at base of sessile (perfect) spikelet, the rachis section and pedicel falling attached to spikelet. *Sessile spikelet* 2-flowered, the upper floret perfect, the lower reduced (sometimes absent), with large firm glumes and thin membranous lemmas. *Pediceled spikelet* reduced in size.

- | | |
|---|---|
| 1. Plants annual | 1. <i>S. malacostachyum</i> |
| 1. Plants perennial. | |
| 2. First glume of sessile spikelet pubescent on back | 2. <i>S. sanguineum</i> var. <i>brevipedicellatum</i> |
| 2. First glume of sessile spikelet glabrous on back | 3. <i>S. cirratum</i> |

1. ***Schizachyrium malacostachyum*** (J. Presl) Nash, N. Amer. Fl. 17:102. 1912. *Andropogon malacostachyus* J. Presl. Delicate erect annual with culms single or in small clumps, mostly 12–50 cm tall, de-

veloping short branches and inflorescences at upper nodes. *Lower sheaths* shorter than internodes. *Ligule* a short ciliate membrane. *Blades* thin, lanceolate-attenuate, the lower mostly 3–8 cm long and 1.5–3 mm broad, with a few long coarse hairs above ligule on adaxial surface. *Inflorescence* a slender spikelike raceme 1.5–4 cm long, enclosed at least below by enlarged and inflated spatheate subtending sheath. *Rachis joints*, pedicels, and lower glume of sessile spikelet pilose with long hairs, at least on lower $\frac{1}{2}$. *Sessile spikelet* 4–5 mm long, with geniculate awn 5–8 mm long. *Pediceled spikelet* greatly reduced, short-awned, on broad stiff erect pedicel.

Southern Baja California and Guerrero to Costa Rica, on loose soil of dry slopes, roadsides, and other moderately disturbed sites. BAJA CALIFORNIA SUR: Boca de la Sierra, S of Santiago, Cape region (*Beetle M-2575*).

2. ***Schizachyrium sanguineum*** (Retz.) Alston var. ***brevipedicellatum*** (Beal) Hatch, Brittonia 30(4):496. 1978. *Andropogon hirtiflorus* (Nees) Kunth var. *brevipedicellatus* Beal. *A. feensis* E. Fourn. **POPOTILLO HIRSUTO**. Cespitose perennial with culms 40–120 cm tall, in small clumps. *Ligule* membranous, 1–2 mm long. *Blades* long, flat, 2–4 mm broad. *Racemes* stiff, 4–10 cm long, 2–4 mm thick, often included in sheath; rachis and pedicels hirsute. *Sessile spikelet* 5–9 mm long, the first glume sparsely to densely hispid-villous on back. *Lemma* of perfect floret membranous, cleft $\frac{3}{4}$ – $\frac{7}{8}$ to base, bearing geniculate awn 15–25 mm long. *Pediceled spikelets* staminate or neuter, 3–5 mm long, narrow, with awn 3–5 mm long.

Southern USA through Mexico and the Antilles to South America, on rocky well-drained slopes at intermediate to high elevations. BAJA CALIFORNIA SUR: Cape region: La Chuparosa; Sierra de San Francisquito (*Brandegge in 1890*); El Taste (*Brandegge 31*).

3. ***Schizachyrium cirratum*** (Hack.) Woot. & Standl., New Mex. Agric. Exp. Sta. Bull. 81:30. 1912. **TEXAS BLUESTEM**. Fig. 89. Tufted perennial lacking rhizomes, with erect culms in small clumps, mostly 30–75 cm tall. *Nodes and sheaths* glabrous. *Ligule* membranous, 1–2.5 mm long. *Blades* elongate, flat, 2–4 mm broad. *Racemes* 4–6 cm long, 2–3 mm broad, usually exserted from sheath. *Rachis internodes* glabrous or ciliate on margins, with tuft of hairs near base. *Sessile spikelets* 8–10 mm long, with glabrous to scabrous glumes. *Lemma* of perfect floret of sessile spikelet cleft $\frac{2}{3}$ – $\frac{3}{4}$ to base, with geniculate awn 13–24 mm long. *Pedicels* with tuft



Fig. 90. *Trachypogon secundus*: plant, perfect spikelet. From Gould and Box, 1965.

of hairs at apex and ciliate half way down one side (occasionally down both sides). *Pedicled spikelets* staminate, 6–8 mm long, awnless.

Western Texas to southern California and through Mexico to Guatemala, on rocky slopes, often in partial shade. BAJA CALIFORNIA SUR: Saucito, near Cabo San Lucas (Brandegge 65).

90. *Trachypogon* Nees

1. *Trachypogon secundus* (Presl) Scribn., U.S.D.A. Div. Agrost. Circ. 32:1. 1901. ZACATE BARBA LARGA. Fig. 90. Cespitose perennial with stiffly erect culms mostly 50–100 cm tall. *Culm nodes* densely bearded but glabrate in age. *Sheaths* rounded or lowermost slightly keeled. *Ligules* of middle leaves a brownish membrane 1–10 mm long; ligule of upper leaves a short fringed membrane. *Blades* elongate, linear, 1–6 (–8) mm broad, often involute when narrow. *Inflorescence* a spikelike raceme usually 10–20 cm long. *Spikelets* in pairs on continuous rachis, one staminate, subsessile, awnless, the other perfect, with slightly longer pedicel and long



Fig. 91. *Elyonurus barbiculmis*: plant, spikelet pair. From Gould and Box, 1965.

awn. *Disarticulation* at base of perfect spikelet. *Staminate spikelet* 6–8 mm long, the first glume strigose-pubescent, rounded on back. *Perfect spikelet* with stout undulant awn 4–6 cm long, densely plumose below with hairs mostly 2–5 mm long.

Dry open rocky slopes, Arizona, New Mexico, and southern Texas, south through Mexico; also Argentina. BAJA CALIFORNIA SUR: Cape region:



Fig. 92. *Heteropogon contortus*: plant, fertile spikelet. From Hitchcock, 1935.

Sierra San Francisquito (Brandege in 1890, cited by Hitchcock, 1913:199, as *T. montufari* (H.B.K.) Nees).

91. *Elyonurus* Humb. & Bonpl. ex Willd.

1. *Elyonurus barbiculmis* Hack. in A. & C. DC., Monogr. Phan. 6:339. 1889. WOOLSPIKE BALSAMSCALE. Fig. 91. Tufted perennial with slender erect culms mostly 40–80 cm tall, pubescent below nodes, the nodes glabrous. *Blades* long, narrow and involute, seldom more than 1.5 mm broad. *Inflorescence* a light green or silvery slender spikelike raceme mostly 5–10 cm long. *Spikelets* awnless, in pairs of one subsessile and perfect and one pediceled and staminate, the two similar in size or pediceled slightly shorter, mostly 4–7 (–8) mm long. *First glume* of both subsessile and pediceled spikelets pilose on back with hairs usually 2–4 mm long, the second glume sparsely hairy.

Western Texas to Arizona and northern Mexico, on dry slopes and rocky plains, mostly in desert grassland and brush at moderately high elevations. BAJA CALIFORNIA SUR: Cape region: San Antonio (Jones in 1926).

92. *Heteropogon* Pers.

Annuals and perennials, without rhizomes or stolons. *Ligule* a short fringed membrane. *Blades* often keeled and folded on midnerve. *Inflorescence* a unilateral spicate raceme, with spikelets in pairs of one sessile and perfect and one pediceled and staminate; at lower nodes of rachis both spikelets staminate. *Spikelets* basically 2-flowered, with lower floret greatly reduced and sometimes absent. *Palea* of upper floret absent. *Staminate spikelets* awnless, with broad green glumes. *Perfect spikelets* with firm coriaceous rounded glumes and membranous lemma with long stout awn.

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|---|---------------------------|
| 1. First glume of staminate spikelet without glands; plants perennial | 1. <i>H. contortus</i> |
| 1. First glume of staminate spikelet with medial row of depressed glands; plants annual | 2. <i>H. melanocarpus</i> |

1. *Heteropogon contortus* (L.) Beauv. ex R. & S., Syst. Veg. 2:836. 1817. RETORCIDO MORENO, TANGLEHEAD. Fig. 92. Cespitose perennial with culms 20–80 cm tall, freely branching at upper nodes in age. *Leaves* glabrous except for a few long hairs in vicinity of ligule. *Lower sheaths* compressed-keeled. *Blades* long, linear, mostly 2–8 mm broad. *Racemes* mostly 4–7 cm long (excluding awns). *Staminate spikelets* 7–10 mm long. *Perfect spikelets* 5–8 mm long, with dark brown hispid glumes. *Lemma awn* commonly 5–12 mm long, hispid, weakly twice-geniculate.

Tropical and subtropical regions of both hemispheres, in North America from Arizona to Texas and southward, on grassy plains and dry mountain slopes, usually in sandy soil. BAJA CALIFORNIA NORTE: Cañón San Matías, 700 m; Isla San Lorenzo SUR. BAJA CALIFORNIA SUR: Common and widespread, to 1200 m; E coast; Sierras San Francisco, Guadalupe, and de la Giganta; Llano de Magdalena; Cape region; Islas San Marcos, Carmen, Danzante, Monserrate, Santa Catalina, San Diego, San Francisco, Espíritu Santo, and Cerralvo.

2. *Heteropogon melanocarpus* (Ell.) Benth., J. Linn. Soc. Bot. 19:71. 1881. RETORCIDO NEGRO, SWEET TANGLEHEAD. Coarse glabrous annual with leafy culms often 1–2 m or more tall, little if at all branched at base but branching at upper nodes. *Lower sheaths* laterally compressed and keeled, the



Fig. 93. *Hackelochloa granularis*: plant, raceme, two views of spikelets with rachis joint. From Hitchcock, 1935.

upper sheaths papillose-glandular on midnerve and sometimes on secondary nerves. *Pediceled spikelets* 1–2.5 cm long, staminate or neuter. *Glands* on midnerve of glume of pediceled spikelets large and distinct.

Throughout the tropics of both hemispheres; in North America from Arizona to South Carolina and southward, usually in low sandy, often weedy or brushy areas but occasionally on sandy mountain slopes. BAJA CALIFORNIA SUR: Uncommon, at intermediate elevations in Cape region: Near San Antonio, 500 m (*Beetle M-2641*, *Gould 12161*); Sierra San Francisquito (*Brandege 33* of 1890, cited by Hitchcock, 1913:212).

93. *Hackelochloa* Kuntze

1. *Hackelochloa granularis* (L.) Kuntze, *Rev. Gen. Pl.* 2:776. 1891. *Ryttilix granularis* (L.) Skeels. Fig. 93. Tufted annual with short broad flat blades and wiry branching culms, commonly with inflorescences developing at all nodes. *Culms* mostly 10–70 cm tall (in our area), the nodes usually hispid. *Sheaths and blades* usually hispid with papillate hairs. *Ligule* a short fringed membrane. *Inflorescence* a spicate raceme axis usually 1–5 cm long to



Fig. 94. *Coix lacryma-jobi*. From Hitchcock, 1935.

base of peduncle, enclosed at base by uppermost leaf sheath, this variously developed, usually inflated, with or without blade. *Rachis* of raceme mostly 1–2 cm long, bearing 2–7 or more pairs of very dissimilar spikelets, one sessile and perfect, the other short-pediceled, staminate or sterile. *Sessile spikelet* thick and rounded, the outer glume coarsely rugose or rectangularly pitted, 1–1.5 mm long. *Glumes of pediceled spikelet* relatively thin, several-nerved, mostly 2–3 mm long.

Throughout the tropics of the world, on woody or brushy hills or open grassy slopes. BAJA CALIFORNIA SUR: Cape region: Sierra San Francisquito (*Brandege in 1890*, cited by Hitchcock, 1913:198); Sierra el Taste, 1500–1600 m (*Carter & Chisaki 3513*).

94. *Coix* L.

1. *Coix lacryma-jobi* L., *Sp. Pl.* 972. 1753. LÁGRIMAS DE JOB, JOB'S-TEARS. Fig. 94. Coarse leafy monoecious annual, with thick succulent culms and broad flat blades. *Leaves* glabrous, mostly 1.5–5 cm broad, and as much as 50 cm long. *Staminate*

spikelets subsessile in two's and three's on slender continuous rachis 1.5–4 cm long, 2-flowered, with thin membranous glumes and hyaline lemmas and paleas. *Pistillate spikelets* below staminate, enclosed in hard bony shiny white to gray or bluish bead-like involucre 6–12 mm long, 3 in each involucre, one pistillate and 2 neuter, the pistillate 1-flowered.

Native to Asia and now widely distributed in tropical regions of the New World. BAJA CALIFORNIA SUR: Reported by Wiggins (1980:950) as "occasionally cultivated as an ornamental and occasionally escaping temporarily and locally; observed in a few gardens in Cape region". We have seen no specimens.

95. *Tripsacum* L.

1. *Tripsacum lanceolatum* Rupr. ex E. Fourn., Mex. Pl. 2:68. 1886. Large coarse monoecious perennial, with culms mostly 1–2 m tall, in small or large clumps from hard rhizomatous base. *Leaf sheaths* hispid at base of plant but nearly glabrous at upper nodes. *Blades* glabrous to moderately pilose, 1–2.8 cm broad. *Inflorescence* a stout spicate raceme or 2 to few spicate branches in compound panicle, the pistillate spikelets below, the staminate above on same axis, the staminate part deciduous as a whole. *Pistillate spikelets* solitary, sessile, sunken in rachis on opposite sides at successive nodes, 1-flowered, awnless, with hard thick glumes partially fused to rachis, forming bony bead-like readily deciduous fruiting structures. *Staminate spikelets* 2-flowered, awnless, in pairs at nodes, at

least one of pair with pedicel 1 mm long, the other usually sessile; glumes thin, several nerved.

Southern Arizona, Mexico, and Guatemala, in canyon bottoms and on forested slopes. BAJA CALIFORNIA SUR: Cape region: Sierra de la Laguna (*Brandegee* 4, cited by de Wet et al., 1976; *Brandegee* in 1892; *Jones* in 1930), Sierra San Francisco (*Brandegee* in 1899, cited by Hitchcock, 1913:196, and by de Wet et al., 1976); El Taste (*Brandegee* in 1902, cited by Hitchcock, 1913:196).

96. *Zea* L.

1. *Zea mays* L., Sp. Pl. 971. 1753. MAÍZ, MAIZE, CORN. Monoecious annual with thick succulent culms mostly 1.5–3 m tall. *Ligule* short, membranous. *Blades* elongate, flat, broad. *Staminate inflorescence* a large terminal panicle with spikelets closely placed, sessile or short pediceled in pairs, on many flexuous racemose branches. *Staminate spikelets* 2-flowered, with large thin strongly nerved glumes. *Pistillate inflorescence* a lateral thickened spike with sessile spikelets crowded in few to numerous rows on thickened corky or woody axis ("cob"), the whole enclosed in several large papery bracts. *Pistillate spikelets* with reduced glumes and 1, infrequently 2, perfect florets, the lower floret usually neuter. *Styles* of pistillate spikelets ("silk") long, flexuous, thread-like, long-exserted from spike.

Maize is cultivated through most of the world as a major food plant of mankind and also is valuable as a source of forage for animals. It is thought to have originated as a domestic plant in eastern Mexico.

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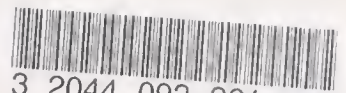
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